Marketing Research Report No. 977

# PRICING PERFORMANCE IN MARKETING FRESH WINTER TOMATOES



ECONOMIC RESEARCH SERVICE • U.S. DEPARTMENT OF AGRICULTURE

## ABSTRACT

Price analysis was used to determine if the behavior of weekly tomato prices at shipping points and wholesale terminal markets is generally consistent with a competitive marketing system. Results indicated that the winter tomato market in 1966-68 performed in an orderly and competitive manner. Prices were established at different locations that were consistent with marketing costs--transportation, storage, and handling. Prices at all locations in the marketing system were closely correlated. Margins were related to the distance transported and the price of the commodity. Shipping-point prices of tomatoes were inversely related to the supply of produce available. Wholesale terminal market prices directly responded to shifts in shipping-point prices. The marketing system for fresh tomatoes generally performed efficiently in establishing prices that cleared the supply of perishable produce each day and week of the marketing season.



Key Words: Vegetables, Tomatoes, Marketing, Pricing performance, Price analysis, Marketing system, Margins, Shipping point, Wholesale terminal markets.


## PREFACE

This report is based on a research project entitled, "An Equilibrium Analysis of the Production, Distribution, and Marketing of Winter Vegetables." The project was a joint effort involving direct cooperation between the North Carolina Agricultural Experiment Station, represented by Richard A. King, Department of Economics, North Carolina State University at Raleigh, and the Economic Research Service (ERS), U.S. Department of Agriculture (USDA).

Two previous publications, Pricing Performance in Marketing Fresh Winter Lettuce, Mktg. Res. Rpt. No. 956, ERS, USDA, May 1972, and Pricing Performance in Marketing Fresh Winter Carrots, Mktg. Res. Rpt. No. 963, June 1972, complete the three-part series.

Primary sources of data for this report were the Federal-State Market News Service, Consumer and Marketing Service, USDA, and the U.S. Department of Commerce.

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## SUMMARY

The system for marketing fresh winter tomatoes operates in an orderly and competitive manner, establishing prices which clear a supply of highly perishable produce daily during the season. Weekly price changes for fresh winter tomatoes were analyzed at shipping points--southern Florida and Mexico are the chief sources of supply--and at 12 major wholesale terminal markets for the winter seasons of 1966-68. Prices of tomatoes were lowest at shipping points, advancing with distance and time to wholesale terminal markets. Average prices of tomatoes increased from $3.99 per 20-pound carton, large and extra-large size, in southern Florida to $4.73 in Chicago and $4.80 in New York. Mexican tomatoes, size 6 x 6 in 3-layer lugs, increased from $4.30 in Nogales, Ariz., to $4.68 in Los Angeles and $5.16 in Chicago.

Prices of winter tomatoes were closely correlated among all locations in the marketing system. For Mexican tomatoes, size 6 x 6, the correlation between prices at the Nogales, Ariz., shipping point and prices at wholesale in Los Angeles was nearly perfect at 0.97. Similar correlations between shipping-point prices and wholesale prices were 0.92 for San Francisco and 0.82 for St. Louis and Chicago.

Based on the physical flow of produce and on buying practices, shipping points were identified as the focal points in the marketing system where prices first change. Wholesale terminal market prices directly responded to shifts in shipping-point prices in the tomato market. In Detroit, for example, the price of Florida large and extra-large vine-ripe tomatoes could be predicted by adding $0.94 to 1.04 times the shipping-point price in southern Florida. Similar relationships held for most other wholesale terminal markets.

Weekly shipping-point tomato prices were inversely related to the supply of produce available. In addition, price estimates were significantly improved by adding proxy variables to reflect the distribution of quality and size of tomatoes. Seventy-three percent of the variation in the price of Florida tomatoes, large and extra-large size, was explained by Florida shipments, Mexican shipments, the previous week's average low temperature at Pompano Beach, Fla., total rainfall in Pompano Beach the previous October, and the size of the current week's shipments from Florida compared with the average for the preceding 2 weeks.

A few areas were observed where possible "poor" performance was indicated and adjustments in institutions and market information systems may be in order. For example, margins were high in Seattle for Mexican tomatoes; in Atlanta and Pittsburgh they were low for Florida tomatoes.

# PRICING PERFORMANCE IN MARKETING FRESH WINTER TOMATOES

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## INTRODUCTION

In recent years, major adjustments in the marketing of fresh tomatoes have occurred. These include a shift toward increased direct buying by large retail organizations and a reduction in the number of ownership transfers between shipping points and retail outlets. As a result, the price-making function has tended to shift from the level of the wholesale terminal market to the point of production.

This report focuses on the shortrun weekly behavior of winter tomato prices at shipping points and wholesale terminal markets. Tomato prices often fluctuate widely over the span of a few days or weeks. For example, the average price of winter tomatoes (20-pound cartons, large and extra-large size) in southern Florida was $4.54 for the week ending February 4, 1966. Three weeks later, the average price per carton had declined to $1.92. By the week ending April 1, 1966, the average price per carton had rebounded sharply to $5.00, an increase of 160 percent in 5 weeks.

## THE WINTER TOMATO INDUSTRY

Southern Florida and Mexico are the two major sources of winter tomatoes for U.S. markets. In southern Florida, production consists of two types of tomatoes: mature-greens, which are harvested just before turning color, and vine-ripes, which are allowed to ripen somewhat before harvesting. During the winter seasons of 1966-68, 46 percent of the Florida tomatoes were vine-ripes and 54 percent were mature-greens. 1/ Other winter domestic production areas included California and colder northern States, such as Ohio, where hothouse or greenhouse tomatoes are grown under artificial conditions.

Mexican winter tomato production, predominantly vine-ripes, is concentrated in the States of Sonora and Sinaloa, principally in the vicinity of Culiacan. A few winter tomatoes are produced on the east coast of Mexico in the State of Tamaulipas. In the winters of 1966-70, Mexico provided 51 percent of tomato shipments and unloads in 41 U.S. cities; in comparison, Florida's share was 47 percent of shipments and 48 percent of unloads (app. table 1).

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1/ Florida Department of Agriculture. Tomatoes. (Annual). Div. of Mktg., Orlando, 1966-68.

In the winter of 1970, Mexico was the main source of tomato unloads for cities on the west coast, such as Los Angeles and San Francisco, and for those in the central region of the United States, including Chicago and Atlanta (table 1). As might be expected, three of the 12 selected cities in which Florida unloads predominated--Washington, D.C., New York, and Boston--are on the eastern seaboard. Pittsburgh unloads were evenly divided between Mexico and Florida, with 113 carlots originating in each area.

Tomato production is concentrated on relatively few farms. The 1969 Census of Agriculture reported 134 farmers raising tomatoes in Dade County and the Pompano and Immokalee-Lee areas of southern Florida. The average tomato acreage per farm ranged from 354 in the Immokalee-Lee area (Lee, Hendry, and Collier Counties) to 184 in Palm Beach County. These production areas accounted for 97 percent of the acreage of late fall, winter, and early spring tomatoes reported by the Crop Reporting Board.

In 1967, there were an estimated 230 tomato growers in southern Florida, including 75 in Dade County, 55 in the Pompano area, and 100 in the Immokalee-Ft. Myers area. 2/ Acreages in tomatoes ranged from 50 to more than a thousand, although most growers averaged 100-500 acres each. By the spring of 1969, the number of growers had dropped considerably.

Data are limited on the number of winter tomato growers in Mexico. According to Fliginger and others, 150 producers were authorized to grow staked tomatoes for export in Sinaloa in 1967-68. However, it was estimated that through combining acreages and other measures, less than 50 separate management units were actually operated. In Sinaloa, roughly half of the more than 55,000 acres in vegetables in the 1966-67 season were tomatoes. Therefore, the average planting was about 500 acres. Several management units controlled 750-1,000 acres of vegetables, with tomato plantings ranging up to 1,000 acres.

Tomato shippers vary in their relationship with growers. In Dade County, Fla., 17 or 18 packing sheds were in operation in 1968. Some shippers custom packed and sold mature-greens for $1-$1.50 per 40-pound carton, while other shippers or grower-shippers relied heavily on their own acreages of tomatoes. In the Pompano area, there were approximately 10 shippers, most of whom packed vine-ripe tomatoes from their own acreage. Immokalee-Lee shippers operated much like those in Dade County. A few sheds custom packed and sold tomatoes for a fee of $1.50 per 40-pound carton or up to $0.90 per 20-pound carton. There was very little contracting of tomato production in the area, although money was sometimes loaned by shippers to finance a grower's first harvest. Many shippers employed a sales agency to sell tomatoes for a fee of $0.25 per carton.

The lower limit on shipping-point f.o.b. prices of tomatoes was the sum of the variable costs of harvesting and marketing. In 1967-68, this was estimated

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2/ C. John Fliginger, Earle E. Gavett, Levi A. Powell, Sr., and Robert P. Jenkins. Supplying U.S. Markets With Fresh Winter Produce: Capabilities of U.S. and Mexican Production Areas. U.S. Dept. Agr., Agr. Econ. Rpt. No. 154, U.S. Govt. Print. Off., Wash., D.C., Sept. 1969.

Table 1.--Absolute and relative shares of tomato unloads in selected cities, by origin and city of destination, January, February, March 1970

| City of destination | Mexico | | Florida | | California | | Other States | | Other countries | | Total, all sources | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Carlots | Percent | Carlots | Percent | Carlots | Percent | Carlots | Percent | Carlots | Percent | Carlots | Percent |
| Los Angeles | 977 | 94.4 | 2 | 0.2 | 54 | 5.2 | 2 | 0.2 | --- | --- | 1,035 | 100 |
| San Francisco | 365 | 97.1 | 6 | 1.6 | 5 | 1.3 | --- | --- | --- | --- | 376 | 100 |
| Dallas | 214 | 96.8 | 7 | 3.2 | --- | --- | --- | --- | --- | --- | 221 | 100 |
| Seattle | 135 | 96.4 | 5 | 3.6 | --- | --- | --- | --- | --- | --- | 140 | 100 |
| St. Louis | 114 | 95.8 | 5 | 4.2 | --- | --- | --- | --- | --- | --- | 119 | 100 |
| Chicago | 342 | 72.5 | 125 | 26.5 | 2 | .4 | 3 | .6 | --- | --- | 472 | 100 |
| Atlanta | 142 | 58.2 | 102 | 41.8 | --- | --- | --- | --- | --- | --- | 244 | 100 |
| Detroit | 262 | 75.5 | 79 | 22.8 | 2 | .6 | 4 | 1.1 | --- | --- | 347 | 100 |
| Pittsburgh | 113 | 48.7 | 113 | 48.7 | --- | --- | 6 | 2.6 | --- | --- | 232 | 100 |
| Washington, D.C. | 84 | 40.2 | 122 | 58.4 | 3 | 1.4 | --- | --- | --- | --- | 209 | 100 |
| New York | 489 | 47.2 | 521 | 50.3 | 23 | 2.2 | 1 | .1 | 2 | 0.2 | 1,036 | 100 |
| Boston | 160 | 43.3 | 207 | 56.1 | 1 | .3 | --- | --- | 1 | .3 | 369 | 100 |
| Total, 12 cities | 3,397 | 70.8 | 1,294 | 26.9 | 90 | 1.9 | 16 | .3 | 3 | .1 | 4,800 | 100 |

Source: Consumer and Marketing Service, U.S. Department of Agriculture.

at $1.71 per 40-pound carton of mature-greens in Dade County, and $1.24 per 20-pound carton of vine-ripes in Pompano and Immokalee-Lee. 3/ In 1970/71, Fliginger indicated the cost of harvesting, packing, and selling southern Florida tomatoes was $1.86 per 40-pound carton of mature-greens and $1.45 per 20-pound carton of vine-ripes. 4/

In Mexico, growers generally operate their own packing sheds. Harvesting and packing costs were estimated at $0.615 per 20 pounds of tomatoes in 1967-68 and $0.66 in 1970-71. (See footnotes 2 and 4.) The marketing of Mexican tomatoes is unique in that most growers have rather close ties with shippers, distributors, and brokers located 600 miles north of the Culiacan production area at Nogales, Ariz. A 1969 directory listed 34 shippers and distributors and 23 brokers handling tomatoes in Nogales. 5/ In addition, five custom brokers specialized in clearing produce across the border. The above types of firms perform several functions, including selling tomatoes to U.S. buyers, facilitating the border crossing procedure, reloading tomatoes from Mexican trailers onto U.S. trucks, and providing capital and management assistance to Mexican producers. 6/ Fliginger indicated that the additional cost of moving tomatoes from packing sheds in Culiacan through the border clearing at Nogales was $1.02 per 20-pound bag in 1967 and $1.04 in 1971. Total variable cost of harvesting, packing, selling, and clearing Mexican tomatoes across the border was $1.64 for a 20-pound flat in 1967 and $1.70 in 1971.

Containers used for tomatoes vary according to the type and size of produce. Green tomatoes are commonly packed in 40-pound cartons, while vine-ripe tomatoes from Florida are packed in cartons holding 20 pounds or more. Smaller tomatoes from Mexico are usually packed in 3-layer wooden lugs holding approximately 30 pounds each; larger tomatoes are packed in 2-layer wooden flats holding 20 pounds or more.

Tomato sizes are based on the number of tomatoes that can be fitted into one layer of the wooden lug or flat. If 5 rows and 6 columns or 30 tomatoes will fill a layer, the size is indicated as 5 x 6; the same is true for 6 x 6, 6 x 7, and other sizes. Hence, the smaller the size the greater the number of tomatoes per layer in the standard lug. Common sizes run from very large tomatoes, such as 4 x 4's, to small sizes, such as 7 x 7's and 7 x 8's. Most winter tomatoes are 5 x 6's, 6 x 6's, and 6 x 7's. In Florida, the size problem is further complicated because size designations are mixed. Small-size tomatoes are 7 x 7's and 7 x 8's; mediums, 6 x 7's and 7 x 7's; medium-large, 6 x 6's and 6 x 7's; large, 5 x 6's and 6 x 6's; and extra-large (or XL), 5 x 5's and 5 x 6's.

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3/ D.L. Brooke. Costs and Returns from Vegetable Crops in Florida: Season 1967-1968 with Comparison. Dept. Agr. Econ., Fla. Agr. Expt. Sta., Gainesville, 1969.

4/ Supplement to Agr. Econ. No. 154, Sept. 1971. (For complete citation, see footnote 2.)

5/ Directory for 1969 sponsored by the West Mexico Vegetable Distributors Association, Nogales, Ariz.

6/ E. Ariza-Nino. Some Economic Aspects of the Northwest Mexico Vegetable Export Industry. Unpublished M.S. thesis, Dept. Agr. Econ., Univ. Ariz., Tucson, 1966.

## PRICE STRUCTURE

Under competitive conditions, prices of tomatoes at shipping points and wholesale terminal markets will differ by no more than marketing costs--transportation, storage, and handling. 7/ With a shift in tomato prices at the shipping point or at the wholesale terminal market, prices at all other locations in the marketing system should vary accordingly. For example, a shift in the price of tomatoes in Nogales, Ariz., should be reflected by shifts in wholesale terminal market prices of Mexican tomatoes in Los Angeles and St. Louis, and of southern Florida tomatoes in New York and Pompano Beach, Fla. In practice, it may take several hours for buyers and sellers to become aware of price changes and several days for fresh supplies to move from point of production to point of consumption. In addition, if shifts in shipping-point prices are imperfectly relayed to wholesale terminal markets, prices at different locations may not adjust (or only partially adjust) and get out of line with marketing costs.

To evaluate whether tomato prices in the short run were consistent with a competitive marketing system, it was necessary to determine: (1) The price structure of the tomato market as measured by the level of shipping-point and wholesale terminal market prices; (2) The relationship between tomato prices at shipping points and wholesale terminal markets; (3) The relationship of observed price differences between the shipping point and the wholesale terminal market and actual costs of transporting, handling, and storing tomatoes; and (4) The reasons for shortrun variations in tomato prices at shipping points.

The study was limited to winter tomatoes marketed in 12 major consuming centers geographically dispersed across the United States. 8/ The basic data for the study included Market News quotations of weekly average prices for tomatoes of good quality and condition at shipping points and at the 12 wholesale terminal markets. The time period covered the months of January, February, and March during the three winter seasons of 1966, 1967, and 1968.

Secondary winter tomato price data consist primarily of daily reports published by the Market News Service of the Fruit and Vegetable Division, Consumer and Marketing Service, U.S. Department of Agriculture. At the shipping point, the daily report includes f.o.b. prices of the common sizes and containers of tomatoes of good quality and condition. At wholesale terminal markets, similar price series are quoted for produce available from first or primary receivers.

For Mexican tomatoes, f.o.b. shipping-point prices of vine-ripe tomatoes of good quality and condition were quoted during the winter at Nogales, Ariz., (the main point of entry). Daily prices were tabulated, using the midpoints of the "mostly" range in price; that is, the price at which "most" of the tomatoes of good quality and condition were sold. A weekly unweighted average price was

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7/ R.W. Bohall. Pricing Performance of the Marketing System for Selected Fresh Winter Vegetables. Unpublished Ph.D thesis, N.C. State Univ., 1971. (Univ. Microfilms, Ann Arbor, Mich.)

8/ The terms "consuming center" and "wholesale terminal market" are used interchangeably throughout this report.

then computed by averaging the daily prices. In Florida, weekly averages for vine-ripe and mature-green tomatoes were available in summary form, based on daily prices on the three active trading days (Monday, Thursday, and Friday) in Dade County and southern Florida.

At wholesale terminal markets, daily prices of tomatoes were tabulated, using the midpoints of the "mostly" range in price. A weekly unweighted average price was then computed by averaging the daily prices, taking into account the shipping point or State and country of origin.

During 1966-68, the Market News average weekly price of vine-ripe Mexican tomatoes in 3-layer lugs, 6 x 6 size, was $4.30 at Nogales, Ariz.; Florida tomatoes in 20-pound cartons, large and extra-large size, averaged $3.99 in southern Florida for the three seasons (app. table 2). Average prices for both Mexican and Florida tomatoes were lowest at the shipping point, generally increasing with distance to the wholesale terminal market (table 2). Mexican 6 x 6's in 3-layer lugs averaged $4.30 in Nogales, $4.68 in Los Angeles, $5.19 in San Francisco, and $6.43 in Seattle. For points east of Nogales, St. Louis prices of Mexican 6 x 6's were high in comparison with Chicago prices, but not unreasonable when compared with San Francisco prices. The Dallas average weekly price of Mexican 6 x 7's was $4.51; in Nogales, it was $3.84. The Dallas price of 6 x 7's was consistent with the St. Louis price of 6 x 6's, if allowance is made for the differential normally paid for the larger 6 x 6 tomatoes.

Florida prices for large and extra-large tomatoes in 20-pound cartons generally increased with distance from southern Florida. In eastern markets, Washington, D.C., and New York prices were in line, as was the Boston price of medium-large tomatoes (allowing for a premium for large and extra-large tomatoes). For Florida tomatoes moving north and west, prices generally increased with time and distance, as indicated by the data for Pittsburgh, Chicago, and Detroit; St. Louis and Atlanta prices were low, close to the level of the price in southern Florida.

Prices increased roughly 6 cents per 100 miles for Florida tomatoes shipped to cities in the eastern half of the United States. With the exception of Seattle, Mexican tomato prices increased roughly 8 cents per 100 miles from Nogales. Mexican tomatoes in 3-layer lugs commanded a premium in St. Louis and Chicago, where they directly competed with Florida produce in 20-pound cartons. Two adjustments for container size and tomato size were necessary to compare prices of Mexican and southern Florida vine-ripes in these two consuming centers. Three-layer lugs hold approximately 30 pounds of tomatoes. Therefore, the prices of 3-layer Mexican lugs in St. Louis and Chicago were reduced by one-third to obtain a 20-pound equivalent price of $3.57 and $3.44, respectively. In comparison, 20-pound cartons of vine-ripes from southern Florida were priced at $4.06 in St. Louis and $4.73 in Chicago.

However, prices of 6 x 6's from Mexico cannot be compared directly with prices of large and extra-large tomatoes from southern Florida, which consist of sizes 6 x 6, 5 x 6, and 5 x 5. Weekly average Nogales, Ariz., prices of vine-ripes, size 5 x 6, were 17.25 cents per pound ($3.45 per 20-pound flat), compared with 14.33 cents per pound ($4.30 per 30-pound lug) for size 6 x 6 tomatoes. Therefore, an allowance of 58 cents was made to adjust for differences in size of Mexican's 6 x 6's and southern Florida large and extra-large tomatoes.

The final adjusted price of Mexican tomatoes on a 20-pound large and extra-large equivalent basis was $4.15 in St. Louis and $4.02 in Chicago. This indicated that Mexican tomatoes commanded a slight premium over southern Florida tomatoes in St. Louis, but were discounted in Chicago. Additional analysis would be needed to provide a satisfactory measure of consuming-center price differences of southern Florida and Mexican tomatoes.

Table 2.--Average tomato prices in 12 selected consuming centers relative to distance from Nogales, Ariz., and southern Florida shipping points, 39 weeks, January, February, March 1966-68

| City | Distance from-- | | Price | | |
|---|---|---|---|---|---|
| | Nogales, Ariz. | Southern Florida | Mexican 3-layer lugs, size 6 x 6 | Florida 20-lb. carton, large and extra-large size | |
| | | | | West | East |
| | Miles | | Dollars | | |
| Seattle | 1,638 | 3,264 | 6.43 | -- | -- |
| San Francisco | 984 | 3,020 | 5.17 | -- | -- |
| Los Angeles | 580 | 2,654 | 4.68 | -- | -- |
| Nogales, Ariz. | 0 | -- | 4.30 | -- | -- |
| Detroit | 1,973 | 1,279 | -- | 4.77 | -- |
| Dallas | 957 | 1,256 | 1/4.51 | -- | -- |
| St. Louis | 1,471 | 1,155 | 5.35 | 4.06 | -- |
| Chicago | 1,727 | 1,289 | 5.16 | 4.73 | -- |
| Pittsburgh | 2,062 | 1,148 | -- | 4.51 | -- |
| Atlanta | 1,762 | 597 | -- | 4.05 | -- |
| Southern Florida | -- | 0 | -- | 3.99 | 3.99 |
| Washington, D.C. | 2,272 | 1,037 | -- | -- | 4.67 |
| New York | 2,426 | 1,273 | -- | -- | 4.80 |
| Boston | 2,630 | 1,479 | -- | -- | 2/4.48 |

1/ Size 6 x 7.
2/ Medium-large.

The price structure of the winter tomato market was generally consistent with a competitive market. Prices of tomatoes of good quality and condition were lowest at the f.o.b. shipping point, advancing with the distance and time required for shipment to the wholesale terminal market. However, relative to other consuming-center prices, Mexican 6 x 6's were high in Seattle, and southern Florida tomatoes were low in St. Louis and Atlanta. In the Atlanta market, the practice followed in the winter seasons of 1966-68 was to report a single price or price range to cover all grades and sizes of tomatoes. Since large and extra-large tomatoes are usually priced higher than medium or medium-large size, the net effect of quoting a single price range was to underestimate the price of the larger size produce.

## COMPARISON OF COSTS AND MARGINS

In a competitive marketing system the difference between the shipping-point and the consuming-center price--the gross margin--is directly related to the costs of transporting, handling, and storing produce. For winter tomatoes the gross margin is the difference between shipping-point prices in Nogales, Ariz., or in southern Florida and wholesale market prices. 9/

Average gross margins for Florida large and extra-large vine-ripes ranged from 52 cents in Pittsburgh to 81 cents in New York for the three winters of 1966-68 (table 3). Gross margins for Mexican 6 x 6's ranged from 38 cents in Los Angeles to $2.13 in Seattle during the same period (table 4).

Gross tomato margins were divided into transportation costs and residual margins. The major component of gross margins is transportation costs from shipping points to selected consuming centers. From January through March 1966-70, Market News reported a total of 38,803 carlot unloads of winter tomatoes from all sources for 41 cities. Of these, 80.3 percent moved by truck and 19.7 percent by railcar, including those by piggyback or truck vans loaded onto rail flatcars (app. table 3).

Mexican shippers used truck transportation for most tomato shipments, with the exception of heavy piggyback shipments to Chicago. Eighty-two percent of the winter tomatoes going to selected cities from Mexico were delivered by truck, although piggyback unloads increased in importance between the winters of 1966 and 1970. Florida also used truck transportation predominantly for all the selected cities except Seattle. Roughly one-third of the unloads of Florida tomatoes in Boston and New York arrived by piggyback.

Rail transportation for tomatoes usually costs less than truck transportation (tables 5 and 6). However, the extensive use of truck transportation for tomatoes may be justified on the basis of the time required to reach consuming centers and the convenience of delivery service. The highly perishable nature of vine-ripe tomatoes provides an incentive to keep transportation time to a

9/ The term "gross margin," as used in this report, differs from the marketing margin used in many USDA studies. The marketing margin refers to the difference between the shipping point and the retail price. Here, the gross margin does not include the wholesale-retail portion of the total price spread.

Table 3.--Breakdown of average weekly gross margin between prices of Florida vine-ripe tomatoes, large and extra-large size, 20-pound cartons, in southern Florida and selected cities, January, February, March 1966-68

| City | Mean price | | Gross margin | Trucking costs | Residual margin |
|---|---|---|---|---|---|
| | Southern Florida | Consuming center | | | |
| | Dollars | | | | |
| Washington, D.C. | 3.99 | 4.67 | 0.68 | 0.35 | 0.33 |
| Pittsburgh | 3.99 | 4.51 | .52 | .45 | .07 |
| Chicago | 3.99 | 4.73 | .74 | .50 | .24 |
| Detroit | 3.99 | 4.77 | .78 | .50 | .28 |
| New York | 3.99 | 4.80 | .81 | .45 | .36 |
| Simple average | --- | --- | --- | --- | .26 |
| Weighted average 1/ | --- | --- | --- | --- | .30 |

1/ Weighted by unloads.

minimum, even if costs are somewhat higher. Trucks carrying Mexican tomatoes rapidly clear the border at Nogales, Ariz., so that the produce can be delivered nearly anywhere in the United States within 4-5 days. Similarly, Florida tomatoes are delivered to most markets within 2-3 days and to more distant points in 4-5 days. Florida truck brokers indicated they could provide a backhaul from the consuming-center market toward Florida in nearly every case which helps keep truck rates competitive.

Transportation cost from the shipping point has a definite influence on the point of origin of unloads in wholesale terminal markets (table 7). For those consuming centers where transportation costs for 20-pound cartons from Florida exceeded those for 2-layer flats from Mexico, over 80 percent of the winter tomato unloads were from Mexico. On the other hand, in eastern cities where the same transportation differential was 20 cents or more in favor of Florida, over three-fourths of the unloads were from Florida. A rough approximation of the breaking point where Florida unloads exceed Mexican tomato unloads is evidently around 13 cents in favor of Florida. With a differential of 10 cents in favor of Florida, Chicago received 59 percent of its unloads from Mexico; Detroit, with a differential of 17 cents, received 64 percent of its unloads from Florida.

The remaining component of the gross tomato margin--the residual margin--goes to wholesale receivers and other first handlers to compensate for unloading and breaking large lots of produce into smaller wholesale units and to compensate for risks and uncertainty in holding produce through time.

Table 4.--Breakdown of the average weekly gross margin between prices of Mexican vine-ripe tomatoes in Nogales, Ariz., and selected cities, January, February, March 1966-68

| City | Size | Mean price | | Gross margin | Trucking costs | Residual margin |
|---|---|---|---|---|---|---|
| | | Nogales, Ariz. | Consuming center | | | |
| | | Dollars | | | | |
| Los Angeles | 5 x 6 1/ | 3.45 | 3.89 | 0.54 | 0.25 | 0.29 |
| San Francisco | do. | 3.45 | 4.35 | .90 | .38 | .52 |
| Seattle | do. | 3.45 | 5.32 | 1.87 | .55 | 1.32 |
| Dallas | do. | 3.45 | 4.14 | .69 | .38 | .31 |
| St. Louis | do. | --- | 4.22 | .77 | .47 | .30 |
| Simple average | do. | --- | --- | --- | --- | .55 |
| Weighted average 2/ | do. | --- | --- | --- | --- | .40 |
| Los Angeles | 6 x 6 3/ | 4.30 | 4.68 | .38 | .33 | .05 |
| San Francisco | do. | 4.30 | 5.17 | .87 | .51 | .36 |
| Seattle | do. | 4.30 | 6.43 | 2.13 | .73 | 1.40 |
| St. Louis | do. | 4.30 | 5.35 | 1.05 | .62 | .43 |
| Chicago | do. | 4.30 | 5.16 | .86 | .80 | .06 |
| Simple average | do. | --- | --- | --- | --- | .46 |
| Weighted average 2/ | do. | --- | --- | --- | --- | .21 |
| Los Angeles | 6 x 7 3/ | 3.84 | 4.14 | .30 | .33 | -.03 |
| San Francisco | do. | 3.84 | 4.62 | .78 | .51 | .27 |
| Seattle | do. | 3.84 | 5.87 | 2.03 | .73 | 1.30 |
| Dallas | do. | 3.84 | 4.51 | .67 | .51 | .16 |
| Simple average | do. | --- | --- | --- | --- | .43 |
| Weighted average 2/ | do. | --- | --- | --- | --- | .14 |

1/ 2-layer flats. 2/ Weighted by unloads. 3/ 3-layer lugs.

Table 5.--Transportation rates of tomatoes from Florida to selected cities, by mode of transportation, 1967-68 1/

| City | Container | Mode of transportation | | |
|---|---|---|---|---|
| | | Rail | Piggyback | Truck |
| | | Dollars | | |
| Atlanta | 20-1b. carton | 0.18 | 0.19 | 0.35 |
| | 40-1b. box | .36 | .38 | .70 |
| Boston | 20-1b. carton | .34 | .33 | .50 |
| | 40-1b. box | .68 | .66 | 1.00 |
| Chicago | 20-1b. carton | .31 | .29 | .50 |
| | 40-1b. box | .62 | .57 | 1.00 |
| Dallas | 20-1b. carton | .32 | n.a. | .40 |
| | 40-1b. box | .64 | n.a. | .80 |
| Detroit | 20-1b. carton | .31 | .29 | .50 |
| | 40-1b. box | .62 | .59 | 1.00 |
| Los Angeles | 20-1b. carton | .58 | .52 | .70 |
| | 40-1b. box | 1.16 | 1.03 | 1.30 |
| New York | 20-1b. carton | .33 | .30 | .45 |
| | 40-1b. box | .65 | .60 | .90 |
| Pittsburgh | 20-1b. carton | .31 | .28 | .45 |
| | 40-1b. box | .62 | .56 | .90 |
| St. Louis | 20-1b. carton | .29 | .27 | .47 |
| | 40-1b. box | .57 | .53 | .95 |
| San Francisco | 20-1b. carton | .58 | .52 | .80 |
| | 40-1b. box | 1.16 | 1.03 | 1.55 |
| Seattle | 20-1b. carton | .58 | n.a. | .90 |
| | 40-1b. box | 1.17 | n.a. | 1.65 |
| Washington, D.C. | 20-1b. carton | .30 | .25 | .35 |
| | 40-1b. box | .61 | .49 | .70 |

n.a. = Not available.

1/ Assumes railcars and Florida trucks hold 1,800 20-pound cartons and 900 40-pound boxes.

Table 6.--Transportation rates of tomatoes from Mexico to selected cities, by mode of transportation, 1967-68 1/

| City | Container | Mode of transportation | | |
|---|---|---|---|---|
| | | Rail | Piggyback | Truck |
| | | Dollars | | |
| Atlanta | 2-layer flat | n.a. | 0.53 | 0.57 |
| | 3-layer lug | n.a. | .71 | .76 |
| Boston | 2-layer flat | 0.61 | .54 | .93 |
| | 3-layer lug | .91 | .72 | 1.24 |
| Chicago | 2-layer flat | .43 | .42 | .60 |
| | 3-layer lug | .64 | .55 | .80 |
| Dallas | 2-layer flat | n.a. | .28 | .38 |
| | 3-layer lug | n.a. | .37 | .51 |
| Detroit | 2-layer flat | .51 | n.a. | .67 |
| | 3-layer lug | .77 | n.a. | .89 |
| Los Angeles | 2-layer flat | n.a. | n.a. | .25 |
| | 3-layer lug | n.a. | n.a. | .33 |
| New York | 2-layer flat | .55 | .52 | .90 |
| | 3-layer lug | .83 | .70 | 1.20 |
| Pittsburgh | 2-layer flat | .59 | .52 | .83 |
| | 3-layer lug | .89 | .70 | 1.11 |
| St. Louis | 2-layer flat | .48 | .42 | .47 |
| | 3-layer lug | .73 | .55 | .62 |
| San Francisco | 2-layer flat | n.a. | n.a. | .38 |
| | 3-layer lug | n.a. | n.a. | .51 |
| Seattle | 2-layer flat | n.a. | n.a. | .55 |
| | 3-layer lug | n.a. | n.a. | .73 |
| Washington, D.C. | 2-layer flat | .55 | .56 | .90 |

n.a. = Not available.

1/ Assumes railcars hold 1,800 2-layer flats and 1,200 3-layer lugs. Trucks and piggyback vans were assumed to hold 1,500 2-layer flats and 1,125 3-layer lugs.

Table 7.--Truck rates to wholesale terminal markets per 20-pound unit of tomatoes, 1967-68, and percentage of winter unloads, by origin, 1966-70

| City | Truck transportation rates, 1967-68 | | | Percentage of 1966-70 winter unloads | |
|---|---|---|---|---|---|
| | 2-layer flat from Mexico 1/ | 20-lb. carton from Florida | Mexico differential | Mexico | Florida |
| | Dollars | | | Percent | |
| Los Angeles | 0.25 | 0.70 | -0.45 | 93.0 | 0.9 |
| San Francisco | .38 | .80 | -.42 | 95.8 | 2.9 |
| Seattle | .55 | .90 | -.35 | 81.2 | 18.6 |
| Dallas | .38 | .40 | -.02 | 85.4 | 14.4 |
| St. Louis | .47 | .47 | 0 | 74.1 | 25.6 |
| Chicago | .60 | .50 | .10 | 59.3 | 39.3 |
| Detroit | .67 | .50 | .17 | 35.0 | 64.4 |
| Atlanta | .57 | .35 | .22 | 21.5 | 78.4 |
| Pittsburgh | .83 | .45 | .38 | 19.0 | 77.7 |
| Boston | .93 | .50 | .43 | 21.9 | 76.7 |
| New York | .90 | .45 | .45 | 23.6 | 75.2 |
| Washington, D.C. | .90 | .35 | .55 | 22.4 | 76.4 |

1/ Approximately 20 pounds.

The size of residual margins for winter vine-ripe tomatoes varied with the origin and size of fruit and also the consuming-center market (tables 3 and 4). Weighted average residual margins for vine-ripe tomatoes were 30 cents for Florida large and extra-large size in 20-pound cartons, and 21 cents for Mexican 6 x 6 size in 3-layer lugs. In Chicago, where both Florida and Mexican vine-ripes were sold, residual margins for tomatoes from Florida were higher than for Mexican produce.

Residual margins for Mexican produce were positively correlated with the size of tomatoes packed. While considerable variation was observed between cities, the average residual margin for Mexican 5 x 6's in 2-layer flats was 40 cents, compared with 21 cents for 6 x 6's and 14 cents for 6 x 7's in 3-layer lugs. This pattern was especially evident in Los Angeles, San Francisco, and Dallas where residual margins on 5 x 6's were higher than on 6 x 6's or 6 x 7's.

Residual margins for Mexican produce also increased with distance for the western cities (Los Angeles, San Francisco, and Seattle). Residual margins for sizes 5 x 6, 6 x 6, and 6 x 7 were lowest for Los Angeles and highest for Seattle, indicating that distance and, hence, higher risk of spoilage influenced the average residual margin for these consuming centers. The main cost of holding produce through time is associated with quality losses from disease and spoilage. Spoilage is a major concern in marketing tomatoes.

For Florida vine-ripes, large and extra-large size, residual margins per 20-pound box varied from 7 cents in Pittsburgh to 36 cents in New York. An average of 30 cents per carton was representative, or approximately $540 per carlot of 1,800 cartons. Manchester 10/ estimated that receivers in 1958 required a residual margin of $250 per carlot for all fruits and vegetables. Primary handlers received a gross margin of 13.2 percent of consuming-center prices, broken down as follows: 6.7 percent for salaries and wages, 5.4 percent for other costs, and 1.1 percent for net income, including 0.2 percent corporate income tax. Allowing for increases in the cost of labor and other services between 1958 and 1966-68, a residual margin of 30 cents per 20-pound carton of large and extra-large tomatoes was not out of line. Tomatoes have a relatively high return per carlot, in comparison with such vegetables as lettuce and carrots. This could be due in part to higher spoilage losses and greater risk in handling tomatoes--carrots are considered a "hardware" vegetable--and the relatively high value per carlot of tomatoes compared with lettuce and carrots. 11/

For Florida tomatoes, residual margins tended to increase with distance and time from the shipping point. Margins in Washington and Pittsburgh were lower than for cities farther north, including New York, Boston, and Detroit.

Residual margins increased on the average for Florida and Mexican vine-ripes between the winters of 1966 and 1968 (app. tables 4-6). Average residual margins for Mexican 6 x 6's were 13, 24, and 26 cents in the winters of 1966,

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10/ A.C. Manchester. The Structure of Wholesale Produce Markets. U.S. Dept. Agr., Econ. Res. Serv., Agr. Econ. Rpt. No. 45, Apr., 1964.

11/ R.W. Bohall. Pricing Performance in Marketing Fresh Winter Lettuce. U.S. Dept. Agr., Econ. Res. Serv., Mktg. Res. Rpt. No. 956, May 1972, and Pricing Performance in Marketing Fresh Winter Carrots, Mktg. Res. Rpt. No. 963, June 1972.

1967, and 1968, respectively, corresponding to average shipping-point prices in Nogales, Ariz., of $3.75, $3.76, and $5.40. Part of this increase may reflect changes in transportation costs. Transportation rates for 1967 and 1968 were used to estimate residual margins; to the extent that rates were lower in the winter of 1966, the residual margins were understated. However, the magnitude of this influence should generally not exceed 5 cents per hundredweight.

Shipping-point prices of all three sizes of Mexican tomatoes studied were relatively stable between the winters of 1966 and 1967 but increased more than $1 per flat or lug in 1968. Weighted average residual margins followed the same trend as shipping-point prices over the three winter seasons, except for 6 x 7's between the winters of 1966 and 1967. In fact, as a percentage of the consuming-center price, residual margins were higher for 5 x 6's and 6 x 7's in the winter of 1968 than during the two previous winters when shipping-point prices were lower (table 8).

Higher consuming-center tomato prices are associated with higher residual margins. First, relatively high prices for winter tomatoes occur when quality is poor and supplies of tomatoes of good quality and condition are limited. With poor quality, the probability of losses due to spoilage is liable to increase at wholesale terminal markets. As a result, higher residual margins are needed to cover handling costs. Second, the capital or investment needed to handle an inventory of tomatoes is directly associated with price. Hence, relatively higher residual margins are needed to cover higher investment costs when prices of winter tomatoes increase. Third, commission merchants and other primary or first handlers of tomatoes in wholesale terminal markets often base charges for their services on selling prices; that is, a commission or percentage of selling price. As a result, residual margins and wholesale market prices are directly correlated.

Shipping-point prices of southern Florida large and extra-large tomatoes followed a trend similar to Mexican tomatoes, with prices up sharply in the winter of 1968. Weighted average residual margins were higher in the winter of 1967 than in 1968. However, for three of five cities, residual margins were highest in 1968 consistent with a higher shipping-point price. In New York, which has a heavy volume of Florida unloads, residual margins declined 6 cents between the winters of 1967 and 1968.

In relative terms, residual margins for Florida vine-ripes, large and extra-large size, averaged 6.1 percent of the consuming-center price, compared with 7.8 percent for Mexican 5 x 6's and 3.8 percent for 6 x 6's (tables 8 and 9). For all cities the weighted residual margin for Mexican 6 x 6's as a percentage of the wholesale terminal market price was 2.7 percent in the winter of 1966, 4.7 percent in the winter of 1967, and 3.9 percent in the winter of 1968. For Florida tomatoes, comparable figures were 4.4 percent in the winter of 1966, 8.0 percent in the winter of 1967, and 5.6 percent in the winter of 1968. In Seattle, residual margins of over 20 percent were observed all 3 years for all sizes of Mexican vine-ripes. This was consistently higher than for any other selected city receiving Mexican or Florida produce.

An average residual margin of 6.1 percent for Florida vine-ripe tomatoes and 7.8 percent for their Mexican counterparts compares with 10.6 percent for California-Arizona lettuce and 5.1 percent for Texas carrots. Tomatoes and

Table 8.--Residual margins for Mexican vine-ripe tomatoes as a percentage of consuming-center market price, selected cities, January, February, March 1966-68 1/

| City | Container | Size | Winter 1966 | Winter 1967 | Winter 1968 | Weighted average, 1966-68 |
|---|---|---|---|---|---|---|
| | | | Percent | | | |
| Los Angeles | 2-layer flat | 5 x 6 | 3.3 | 4.5 | 6.4 | 4.7 |
| San Francisco | do. | do. | 11.3 | 9.7 | 14.2 | 11.7 |
| Seattle | do. | do. | 25.8 | 25.8 | 23.5 | 25.1 |
| Dallas | do. | do. | 7.0 | 6.4 | 8.8 | 7.4 |
| St. Louis | do. | do. | 9.1 | 10.0 | 3.9 | 7.5 |
| Simple average | do. | do. | 11.3 | 11.3 | 11.4 | --- |
| Weighted average 2/ | do. | do. | 6.8 | 7.5 | 9.1 | 7.8 |
| Los Angeles | 3-layer lug | 6 x 6 | 0.2 | 1.4 | 1.7 | 1.1 |
| San Francisco | do. | do. | 5.1 | 8.4 | 7.1 | 6.9 |
| Seattle | do. | do. | 20.0 | 25.4 | 20.2 | 22.1 |
| St. Louis | do. | do. | 7.0 | 11.9 | 5.8 | 8.2 |
| Chicago | do. | do. | 1.7 | .2 | 1.3 | 1.0 |
| Simple average | do. | do. | 6.8 | 9.5 | 7.2 | --- |
| Weighted average 2/ | do. | do. | 2.7 | 4.7 | 3.9 | 3.8 |
| Los Angeles | 3-layer lug | 6 x 7 | -2.2 | -2.8 | 1.9 | -1.1 |
| San Francisco | do. | do. | 2.2 | 4.7 | 9.1 | 5.3 |
| Seattle | do. | do. | 20.5 | 24.3 | 22.2 | 22.5 |
| Dallas | do. | do. | 2.9 | 3.5 | 3.7 | 3.4 |
| Simple average | do. | do. | 5.8 | 7.4 | 9.2 | --- |
| Weighted average 2/ | do. | do. | 0.5 | 1.4 | 4.9 | 2.2 |

1/ Source: Derived from appendix tables 4 and 5.
2/ Weighted by unloads from Mexico.

Table 9.--Residual margins for Florida vine-ripe tomatoes, large and extra-large size, 20-pound carton, as a percentage of consuming-center market price, selected cities, January, February, March 1966-68 1/

| City | Winter 1966 | Winter 1967 | Winter 1968 | Weighted average, 1966-68 2/ |
|---|---|---|---|---|
| | Percent | | | |
| Washington, D.C. | 8.7 | 7.5 | 5.7 | 7.5 |
| Pittsburgh | 1.5 | 1.0 | 2.5 | 1.7 |
| Chicago | .7 | 9.0 | 5.1 | 4.8 |
| Detroit | 4.3 | 6.8 | 6.2 | 5.8 |
| New York | 5.1 | 9.7 | 6.0 | 7.0 |
| Simple average | 4.1 | 6.8 | 5.1 | --- |
| Weighted average 3/ | 4.4 | 8.0 | 5.6 | 6.1 |

1/ Source: Derived from appendix table 6.
2/ Average of all sizes in city.
3/ Weighted by unloads from Florida.

lettuce are the most perishable, and carrots the least perishable, of the three fresh vegetables studied. Residual margins were concluded to be directly related to the perishability of the crop, although the relative residual margin on Mexican 6 x 6's was only 3.8 percent. The low residual margin on Mexican 6 x 6's was heavily influenced by low margins in two major consuming centers.

Residual margins for Mexican tomatoes were low in Los Angeles and Chicago and extremely high in Seattle. A low residual margin in Los Angeles and a high in Seattle were consistent with the risks of shipping tomatoes long distances. However, a low residual margin for Mexican tomatoes in Chicago was inconsistent with the time and risk hypothesis. In all three winters of 1966-68, average prices of Mexican 6 x 6's in 3-layer lugs were higher in St. Louis than in Chicago, 249 miles farther north.

There was no obvious reason for a low residual margin on Mexican tomatoes in Chicago. In the winters of 1967 and 1968, Mexico supplied over half that city's unloads. Since Chicago is a major rail and truck terminus and uncommitted shipments from Mexico can be sold in Chicago or diverted to eastern consuming centers, the Chicago market may serve as a dumping point for excess Mexican tomatoes. This would tend to keep residual margins small during the study period. Chicago also received a substantial volume of tomatoes from Florida. It is possible that excess tomatoes from southern Florida may have also been diverted

to commission merchants and receivers at the Chicago wholesale terminal. As a result of intense competition for the Chicago trade by shippers from both Mexico and southern Florida, wholesale market prices may have been depressed; hence, residual margins may have been smaller than normal during the study period.

The Seattle market contrasts sharply with Chicago. Residual margins for Mexican tomatoes were extremely high in Seattle relative to other consuming-center markets. Seattle does not represent a diversion point, since it would be difficult to send excess tomatoes to alternative markets unless they were exported to Canada. For this reason, shippers may be reluctant to send tomatoes into the Seattle market without a firm committment from buyers.

The residual margin in Seattle is also apparently influenced by the institutional arrangements for procuring supplies from the shipping point. Many wholesalers in the consuming center purchased less than carload lots of produce through terminal buying brokers located in Seattle. A fee of approximately 25 cents per package was commonly charged for this service. In terms of market efficiency, wholesalers in Seattle apparently incurred an extra expense in procuring fresh supplies not borne in other consuming-center markets.

Residual margins for southern Florida tomatoes were high in Boston, New York, and Detroit. Each of these cities received more than 64 percent of their winter tomato unloads in 1966-70 from Florida. Conversely, residual margins were low in Chicago and St. Louis, each of which received over 59 percent of their winter tomatoes from Mexico. Thus, there was some evidence that residual margins and market shares were positively related. Where competition between Mexico and Florida tomatoes was the strongest, residual margins were the lowest. Over time in a competitive market, residual margins for Florida tomatoes in all markets should be nearly equal, assuming comparable costs of storing and handling.

Overall, transportation costs accounted for more than 50 percent of the gross margins between shipping points and wholesale terminal markets for Florida tomatoes, large and extra-large size, and for Mexican 6 x 6's. (Seattle was the only exception to this finding.) Shipping costs were less by rail than by truck to many cities. Nevertheless, 80 percent of the winter tomatoes were moved by truck due to the speed and convenience of this mode of transportation. The source of tomato unloads was related to the relative truck transportation rates from Florida and Mexico. When truck rates favored Florida origins by 13 cents, it was estimated that unloads would come equally from Mexico and Florida.

The average residual margin was 30 cents for Florida tomatoes, large and extra-large size, and 40 and 21 cents for Mexican 5 x 6's and 6 x 6's, respectively. While a detailed study of handling and storage costs was not possible, previous research indicated these residual margins were not out of line with marketing costs for other vegetables, especially if the perishable nature of tomatoes is taken into account.

In general, residual margins rose with distance and time to consuming-center markets, consistent with price and increased risk due to spoilage. It was concluded, therefore, that the relationship of observed differentials between tomato prices at the shipping point and at the wholesale terminal market, and actual costs of transporting, handling, and storing tomatoes, while not perfect,

was generally consistent with a competitive marketing system. As noted earlier, exceptions were Seattle, where residual margins were extremely high, and Chicago, where they were low.

## RELATIONSHIP OF WHOLESALE TERMINAL MARKET AND SHIPPING-POINT PRICES

Shipping points represent produce market centers in which there are interactions between buyers and sellers, especially with the larger and more important chain stores and other direct wholesale buyers. Hence, in the short run, it was hypothesized that price changes occur first at shipping points, then are reflected at other locations in the marketing system. At wholesale terminal markets, direct buyers will have a portion of their weekly supplies arriving from shipping points and hence only need to supplement their direct receipts with supplies from the local terminal. As a result, direct buyers are keenly aware of the price differential between the wholesale terminal market and the various shipping points with which they have contact.

Four possibilities exist when firms obtain some of their produce direct:

(1) When wholesale terminal market supplies are required to fill expected needs of customers and the shipping-point price is high relative to the wholesale terminal market price, the buyer will purchase from the local wholesale terminal;

(2) When wholesale terminal market supplies are required to fill expected needs of customers and the shipping-point price is low relative to the price at the wholesale terminal market, the buyer will delay or cancel some purchases and buy extra supplies direct from the shipping point;

(3) When wholesale terminal market supplies are not needed to fill expected needs of customers and the shipping-point price is high relative to the wholesale terminal market price, the buyer may make some purchases locally for future use but decrease direct buying;

(4) When wholesale terminal market supplies are not required to fill expected needs of customers and the shipping-point price is low relative to the wholesale terminal market price, buyers will not purchase from the local wholesale terminal but may make some purchases direct from the shipping point for future use.

The reaction of direct buyers to the relative price differential between the wholesale terminal market and the shipping point will be felt at the shipping point as soon as direct purchases are moved or not moved to the wholesale terminal.

In addition to the possibility of obtaining supplies from shipping points, local wholesale handlers and retail organizations may have an additional option of buying uncommitted supplies ("rollers") en route to wholesale terminal markets. These supplies, if available, may be (1) in the hands of brokers; (2) assigned to commission merchants on the local terminal market; or (3) approaching major

diversion points for eastern tomato buyers, such as St. Louis or Chicago, while still uncommitted by the shipper. Another option is to obtain supplies from nearby wholesale terminal markets.

The ability of direct buyers to purchase tomatoes from shipping points, from uncommitted supplies en route, and from other wholesale terminal markets suggests that prices at all locations in the marketing system will be closely related. As a test, the relationships between f.o.b. shipping-point and selected city tomato prices were measured for the winters of 1966-68. Market News data were used to derive weekly f.o.b. shipping-point prices of Mexican and Florida tomatoes and the weekly prices of Mexican and Florida tomatoes in each of the 12 selected cities. Correlation analysis was used to compare prices; regression analysis, to measure the relationship between prices at shipping points and at wholesale terminal markets.

## Current Prices

In general, shipping-point and consuming-center market prices for winter tomatoes were closely related. For all sizes of Mexican tomatoes, correlations between f.o.b. shipping-point and consuming-center prices were high for nearby cities but declined for more distant wholesale terminal markets. In all cities and for all three sizes of Mexican tomatoes, the correlation between pairs of prices was 0.75 or better, indicating that increases in Nogales, Ariz., prices were, on the average, positively associated with changes in consuming-center market prices of Mexican tomatoes, and vice versa.

| Tomato size and consuming-center market | Correlation with Nogales-Ariz., shipping-point price |
|---|---|
| Size 5 x 6: | |
| Los Angeles | 0.96 |
| San Francisco | .90 |
| Seattle | .75 |
| Dallas | .84 |
| St. Louis | .80 |
| Size 6 x 6: | |
| Los Angeles | .97 |
| San Francisco | .92 |
| Seattle | .80 |
| St. Louis | .82 |
| Chicago | .82 |
| Size 6 x 7: | |
| Los Angeles | .95 |
| San Francisco | .92 |
| Seattle | .76 |
| Dallas | .87 |

Distance, and hence time, was related to the degree of correlation between consuming-center and Nogales, Ariz., shipping-point tomato prices. The highest coefficients were obtained for Los Angeles and San Francisco, both located close to the Nogales shipping point. Conversely, the correlations between shipping-point and consuming-center tomato prices for cities farther from Nogales (Seattle, Dallas, St. Louis, and Chicago), while still relatively high, were definitely lower than for the two California cities. Consuming-center prices for Mexican tomatoes were thus concluded to be significantly related to the weekly Nogales shipping-point price.

Correlations between shipping-point and consuming-center prices of southern Florida tomatoes were also generally high and positive. For distant cities, including New York, Boston, and Chicago, they were actually higher than for nearby markets at Atlanta and Washington, D.C. With the exception of St. Louis, all correlations for medium-large tomatoes were 0.80 or above; for large and extra-large tomatoes, they were at least 0.87.

| Tomato size and consuming-center market | Correlation with southern Florida shipping-point price |
|---|---|
| Large and extra-large: | |
| Atlanta | 0.89 |
| Washington, D.C. | .87 |
| Pittsburgh | .95 |
| Chicago | .89 |
| Detroit | .91 |
| New York | .93 |
| Medium-large: | |
| St. Louis | .71 |
| Pittsburgh | .92 |
| Detroit | .84 |
| New York | .90 |
| Boston | .92 |
| Medium: | |
| Detroit | .80 |
| Boston | .87 |

High correlations between Mexican and southern Florida shipping-point and wholesale terminal market prices suggested that city to city price relationships should be just as strong. All possible comparisons of sets of consuming-center prices were computed between cities and the corresponding correlations obtained (tables 10 and 11). The matrices of correlation coefficients between weekly consuming-center market tomato prices verified that strong price interrelationships existed between population centers in the United States.

Prices of Mexican tomatoes were closely associated for different sizes sold within a given wholesale terminal market and for city to city prices in terminal markets located close or intermediate to the shipping point. In table 10, the small triangles represent intracity price correlations for different sizes of

Table 10.--Correlation coefficients between weekly tomato prices, Mexican vine-ripes, by size, selected cities, January, February, March 1966-68 1/

| City | Size | Los Angeles | | San Francisco | | | Seattle | | | Dallas | | St. Louis | | Chicago |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 6 x 6 | 6 x 7 | 5 x 6 | 6 x 6 | 6 x 7 | 5 x 6 | 6 x 6 | 6 x 7 | 5 x 6 | 6 x 7 | 5 x 6 | 6 x 6 | 6 x 6 |
| Los Angeles | 5 x 6 | 0.97 | 0.94 | 0.95 | 0.91 | 0.91 | 0.81 | 0.77 | 0.72 | 0.91 | 0.85 | 0.85 | 0.79 | 0.74 |
| | 6 x 6 | | .97 | .95 | .95 | .95 | .84 | .82 | .78 | .90 | .89 | .87 | .84 | .79 |
| | 6 x 7 | | | .92 | .93 | .94 | .78 | .79 | .77 | .85 | .89 | .82 | .80 | .76 |
| San Francisco | 5 x 6 | | | | .97 | .95 | .88 | .87 | .82 | .95 | .92 | .92 | .90 | .84 |
| | 6 x 6 | | | | | .97 | .90 | .89 | .85 | .92 | .94 | .91 | .90 | .84 |
| | 6 x 7 | | | | | | .88 | .88 | .86 | .91 | .94 | .90 | .89 | .83 |
| Seattle | 5 x 6 | | | | | | | .94 | .86 | .86 | .84 | .89 | .90 | .82 |
| | 6 x 6 | | | | | | | | .95 | .85 | .87 | .91 | .92 | .83 |
| | 6 x 7 | | | | | | | | | .79 | .84 | .84 | .89 | .82 |
| Dallas | 5 x 6 | | | | | | | | | | .91 | .94 | .90 | .81 |
| | 6 x 7 | | | | | | | | | | | .91 | .92 | .86 |
| St. Louis | 5 x 6 | | | | | | | | | | | | .96 | .85 |
| | 6 x 6 | | | | | | | | | | | | | .86 |

1/ 5 x 6's packed in 2-layer flats; 6 x 6's and 6 x 7's packed in 3-layer lugs.

Table 11.--Correlation coefficients between weekly tomato prices, Florida vine-ripes, by size, in 20-pound cartons, selected cities, January, February, March 1966-68

| Size and consuming center | Large and extra-large | | | | | Medium-large | | | | | Medium | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Washington, D.C. | Pittsburgh | Chicago | Detroit | New York | St. Louis | Pittsburgh | Detroit | New York | Boston | Detroit | Boston |
| Large and extra-large: | | | | | | | | | | | | |
| Atlanta | 0.91 | 0.92 | 0.91 | 0.94 | 0.90 | 0.81 | 0.91 | 0.79 | 0.89 | 0.89 | 0.74 | 0.87 |
| Washington, D.C. | | .91 | .87 | .90 | .88 | .73 | .89 | .79 | .83 | .90 | .77 | .85 |
| Pittsburgh | | | .93 | .96 | .96 | .69 | .97 | .89 | .93 | .95 | .89 | .90 |
| Chicago | | | | .92 | .92 | .63 | .93 | .87 | .89 | .88 | .83 | .86 |
| Detroit | | | | | .93 | .76 | .94 | .91 | .90 | .93 | .86 | .91 |
| New York | | | | | | .71 | .93 | .85 | .97 | .91 | .86 | .89 |
| Medium-large: | | | | | | | | | | | | |
| St. Louis | | | | | | | .62 | .57 | .71 | .73 | .53 | .67 |
| Pittsburgh | | | | | | | | .86 | .90 | .93 | .86 | .91 |
| Detroit | | | | | | | | | .90 | .86 | .94 | .83 |
| New York | | | | | | | | | | .91 | .79 | .87 |
| Boston | | | | | | | | | | | .85 | .95 |
| Medium: | | | | | | | | | | | | |
| Detroit | | | | | | | | | | | | .82 |

Mexican tomatoes. The correlation coefficients are generally 0.90 or better and are as high as 0.97, indicating a close association between prices. Los Angeles and San Francisco price correlations were all 0.91 or better; in San Francisco, Dallas, and St. Louis, all city to city price correlations were 0.89 or better, indicating strong price relationships for cities intermediate in distance to Nogales, Ariz. Price correlations involving the more distant cities of Seattle and Chicago ranged from 0.72 to 0.92, with most values in the 0.80's. An examination of correlations by sizes indicated that coefficients involving 6 x 7's tended to be lower than for 5 x 6's and 6 x 6's. This may be due in part to substantially higher marketings of large-size tomatoes. (Roughly 55-70 percent were 6 x 6 and larger.)

City to city price correlations for southern Florida vine-ripe tomatoes were generally high, especially for large and extra-large tomatoes, the predominant sizes produced in the region. All coefficients involving city to city price correlations for Atlanta, Pittsburgh, New York, Chicago, and Detroit were 0.90 or better for large and extra-large size tomatoes.

Correlations involving different sizes of Florida tomatoes sold in the same city were also high and are underlined in table 11 for identification. Price correlations involving medium-large and medium Florida tomatoes, while usually in the 0.80's and 0.90's, were not as high as those for large and extra-large sizes. No particular trend was noted between distance from the shipping point and strength of correlations, although correlations for wholesale terminal markets located close together were generally strong.

## Lagged Prices

As a further test of the relationship between shipping-point and consuming-center market prices, lagged price correlations were run for both Mexican and Florida tomatoes. Mexican tomato prices were lagged 1 week and correlations were run with current consuming-center prices. Consuming-center prices of Mexican tomatoes were then lagged 1 week and compared with current shipping-point prices.

When Nogales, Ariz., prices were lagged 1 week, correlations decreased for cities close to the shipping point (Los Angeles, San Francisco, and Dallas) and also for the major wholesale terminal market in Chicago (table 12). Correlations increased for Seattle and St. Louis. In Seattle and St. Louis, the higher correlation indicated there was a time lag between the shift of Nogales prices and the shift of consuming-center prices. This suggests that while wholesale prices may be conditioned by local shortrun supply and demand conditions, wholesalers basically follow a cost-plus pricing policy. The lag was approximately consistent with the time required for transportation between Nogales and these distant consuming centers. Since shipments to Seattle may require up to 7 days, lagging prices 1 week improved price correlations.

On the other hand, correlations between consuming-center prices and Nogales, Ariz., shipping-point prices 1 week ahead were in the range of 0.4 to 0.6. This was considerably below current or lagged correlations, providing additional evidence that current supply and demand conditions that establish the overall price level are focused at the shipping point. Mexican tomato prices in individual terminal markets are modified by local supply and demand conditions, but the

Table 12.--Correlation coefficients 1/ between current consuming-center prices and Nogales, Ariz., shipping-point prices, Mexican vine-ripes, January, February, March 1966-68

| Tomato size and consuming center | Nogales, Ariz., shipping-point prices | | |
|---|---|---|---|
| | Current week (t) | Previous week (t-1) | Following week (t+1) |
| Size 5 x 6: | | | |
| Los Angeles | 0.96 | 0.67 | 0.47 |
| San Francisco | .90 | .77 | .47 |
| Seattle | .75 | .86 | .45 |
| Dallas | .84 | .83 | .39 |
| St. Louis | .80 | .91 | .42 |
| Size 6 x 6: | | | |
| Los Angeles | .97 | .68 | .59 |
| San Francisco | .92 | .78 | .53 |
| Seattle | .80 | .88 | .51 |
| St. Louis | .82 | .89 | .47 |
| Chicago | .82 | .72 | .59 |
| Size 6 x 7: | | | |
| Los Angeles | .95 | .63 | .52 |
| San Francisco | .92 | .76 | .54 |
| Seattle | .76 | .84 | .45 |
| Dallas | .87 | .85 | .48 |

1/ Based on 39 observations for current-week correlations and 36 observations for other correlations.

fundamental price discovery takes place at the shipping point--not in the individual terminal market. Thus, price changes in the short run tend to move from shipping point to consuming centers consistent with the physical flow of produce.

In terms of risk and uncertainty, it is evident that today's change in the price of Mexican tomatoes at the shipping point will soon be felt at the wholesale terminal market. This week's wholesale terminal market price, on the other

hand, has only a limited impact on next week's shipping-point price. 12/ Thus, direct buyers in wholesale terminal markets can reduce risks by being aware of prices in both the local wholesale terminal market and the shipping point. Shifts in f.o.b. shipping-point prices will soon be reflected at wholesale terminal markets.

A similar test using lagged shipping-point prices for southern Florida tomatoes generally did not improve correlations with consuming-center prices of Florida vine-ripes (table 13). This was not unexpected in that less than 1 week is normally required to transport tomatoes from southern Florida to consuming centers in the eastern half of the United States.

Correlations between consuming-center prices and southern Florida shipping-point prices 1 week ahead were 0.42 to 0.67, again indicating that price changes in the short run tend to move from the shipping point to consuming centers consistent with the physical flow of produce.

## Price Prediction at Wholesale Terminal Market

Based on the physical flow of produce and on buying practices, it was expected that shipping-point and wholesale terminal market prices would be directly related. Direct buyers, particularly large retail organizations and consuming-center receivers, deal extensively with shippers and grower-shippers in production areas. Hence, shipping-point prices are representative of the fresh winter tomato market. Consuming-center prices should equal the shipping-point price plus transportation, handling and storage costs, and a random error. In a regression framework, this may be written as:

$$Y_{ijk} = a_{ij} + b_{ij} Y_{Tjk}$$

where

$Y_{ijk}$ = consuming-center market price for tomatoes in 20-pound cartons, 2-layer flats, or 3-layer lugs for consuming-center market i, origin j, week k;

$Y_{Tjk}$ = the blend f.o.b. price of tomatoes at shipping point j in week k;

i = Atlanta, Boston, Chicago, Dallas, Detroit, New York, Pittsburgh, St. Louis, San Francisco, and Seattle.

j = shipping point (Nogales, Ariz., or southern Florida).

k = weeks 1-39 with 1-13 = winter 1966; 14-26 = winter 1967; and 27-39 = winter 1968.

The null hypothesis tested was that $b_{ij}$ or each regression coefficient associated with $Y_{Tjk}$ was equal to 1.0 or $H_o$: B = 1. For Mexican tomatoes, this

12/ In a longer run context, wholesale terminal market prices will, of course, influence production decisions at the shipping point and, in turn, shipping-point prices.

Table 13.--Correlation coefficients 1/ between current consuming-center prices and southern Florida shipping-point prices, Florida vine-ripe tomatoes, January, February, March 1966-68

| Tomato size and consuming center | Southern Florida shipping-point prices | | |
|---|---|---|---|
| | Current week (t) | Previous week (t-1) | Following week (t+1) |
| Large and extra-large: | | | |
| Atlanta | 0.89 | 0.92 | 0.62 |
| Washington, D.C. | .87 | .86 | .59 |
| Pittsburgh | .95 | .85 | .65 |
| Chicago | .89 | .84 | .55 |
| Detroit | .91 | .91 | .60 |
| New York | .93 | .80 | .65 |
| Medium-large: | | | |
| St. Louis | .71 | .80 | .62 |
| Pittsburgh | .92 | .85 | .61 |
| Detroit | .84 | .79 | .42 |
| New York | .90 | .78 | .67 |
| Boston | .92 | .87 | .66 |
| Medium: | | | |
| Detroit | .80 | .80 | .44 |
| Boston | .87 | .91 | .63 |

1/ Based on 39 observations for current week correlations and 36 observations for other correlations.

hypothesis was not rejected for 12 of 14 equations at the 5-percent level of significance (table 14). It was concluded that the consuming-center market price of Mexican tomatoes was equivalent to the Nogales, Ariz., price plus a constant transportation, storage, and handling charge.

Using the data in table 14, the price of Mexican tomatoes, size 5 x 6, could be predicted in Dallas, for example, by adding 78 cents to 0.97 times the Nogales, Ariz., price of Mexican tomatoes, size 5 x 6. If the Nogales price were $3.50 per 2-layer flat, the expected price in Dallas would be $4.18.

Table 14.--Results of regressing consuming-center market prices of Mexican vine-ripe tomatoes on Nogales, Ariz., shipping-point prices, weekly data, January, February, March 1966-68

| Tomato size and consuming center | Constant term "a" | Regression coefficient "b" | Standard error "b" | $r^2$ | t for $H_0$:B = 1.0 |
|---|---|---|---|---|---|
| Size 5 x 6: | | | | | |
| Los Angeles | -0.09 | 1.15 | 0.058 | 0.92 | 2.67* |
| San Francisco | .47 | 1.13 | .090 | .81 | 1.39 |
| Seattle 1/ | 1.78 | 1.01 | .010 | .74 | .00 |
| Dallas | .78 | .97 | .104 | .71 | .24 |
| St. Louis 1/ | 1.20 | .90 | .071 | .82 | 1.38 |
| Size 6 x 6: | | | | | |
| Los Angeles | .00 | 1.09 | .049 | .94 | 1.84 |
| San Francisco | .85 | 1.01 | .071 | .85 | .14 |
| Seattle 1/ | 2.14 | 1.00 | .094 | .77 | .03 |
| St. Louis 1/ | 1.61 | .88 | .076 | .80 | 1.59 |
| Chicago | 1.51 | .85 | .096 | .67 | 1.58 |
| Size 6 x 7: | | | | | |
| Los Angeles | -.34 | 1.17 | .063 | .90 | 2.70* |
| San Francisco | .35 | 1.11 | .079 | .85 | 1.40 |
| Seattle 1/ | 1.77 | 1.07 | .120 | .70 | .62 |
| Dallas | 1.27 | .84 | .078 | .76 | 2.01 |

* = Significant at the 5-percent level.
1/ Lagged 1 week.

The same type of relation held for five of the six cities receiving large and extra-large tomatoes from southern Florida (table 15). Results for medium-large and medium tomatoes were not as strong, and the hypothesis that $b_{ij} = 1.0$ was rejected for five of the seven equations. This, in part, may reflect the influence of locally repacked mature-green tomatoes in cities receiving southern Florida vine-ripes. Mature-greens are ripened at wholesale terminal markets and are usually packed in cellophane tubes. Similarly, smaller size vine-ripes can be repacked in tubes so they compete directly with mature-greens. As a result, wholesale terminal market prices of medium-large and medium vine-ripes are influenced by the supply of mature-greens available as well as by the shipping-point price of vine-ripes. Fliginger, indicating that small vine-ripes seem to compete fairly strongly with large mature-greens, concluded that the removal of smaller vine-ripes from the market supply would tend to raise prices of both mature-green and vine-ripe tomatoes. (See footnote 2.)

Using the data in table 15, the consuming-center price of southern Florida large and extra-large tomatoes could be predicted by using the shipping-point price. For example, if the southern Florida price of large and extra-large vine-ripes was $4.00 per 20-pound carton, the expected price in Detroit would be $0.94 plus 1.04 times the southern Florida price, or $5.10.

It was concluded, therefore, that wholesale terminal market and shipping-point tomato prices were very closely related and consistent with those of a competitive marketing system, especially for all sizes of Mexican tomatoes and for southern Florida large and extra-large vine-ripes.

## PRICE PREDICTION AT SHIPPING POINT

Nogales, Ariz., and southern Florida tomato prices were found to be closely associated with wholesale terminal market prices at all other locations in the marketing system. Hence, if the price level and variations in prices could be predicted or explained at these shipping points, prices or shifts in price for the entire marketing system would be predictable.

Week-to-week variations in shipping-point tomato prices result from shifts in the available supply of tomatoes. The quantity of tomatoes available in any given week is determined by plantings scheduled several weeks previously. Shipments cannot be held back since it is not feasible to delay harvest once maturity is reached; moreover, storage of the perishable crop is impractical. With predetermined weekly supplies, predicting tomato prices becomes a problem of estimating the relationship between the shipping-point price and the quantity of tomatoes available. 13/

Weekly Market News data were used to estimate f.o.b. shipping-point prices of winter tomatoes. Weekly data on shipments were available for Florida, other

13/ The demand at the shipping point for winter tomatoes was assumed fixed over the winter seasons of 1966-68. This implies that the net effect of changes in consumer tastes and preferences, population, consumer income, prices of related goods, and range of goods available did not cause a shift in the relationship between shipping-point price and quantity of tomatoes during the study period.

Table 15.--Results of regressing consuming-center market prices of Florida vine-ripe tomatoes on southern Florida shipping-point prices, weekly data, January, February, March 1966-68

| Tomato size and consuming center | Constant term "a" | Regression coefficient "b" | Standard error "b" | $r^2$ | t for $H_0$:B = 1.0 |
|---|---|---|---|---|---|
| Large and extra-large: | | | | | |
| Atlanta | -0.53 | 1.15 | 0.097 | 0.79 | 1.52 |
| Washington, D.C. | 1.41 | .82 | .076 | .76 | 2.37* |
| Pittsburgh | .53 | 1.00 | .053 | .91 | .00 |
| Chicago | .78 | .99 | .084 | .79 | .13 |
| Detroit | .94 | 1.04 | .070 | .88 | .57 |
| New York | 1.17 | .91 | .060 | .86 | 1.50 |
| Medium-large: | | | | | |
| St. Louis | 1.77 | .75 | .123 | .50 | 2.06* |
| Pittsburgh | .99 | .83 | .059 | .85 | 2.93** |
| Detroit | 2.26 | .72 | .078 | .71 | 2.30* |
| New York | 1.42 | 1.03 | .083 | .81 | .36 |
| Boston | 1.14 | 1.09 | .077 | .85 | 1.19 |
| Medium: | | | | | |
| Detroit 1/ | 1.85 | .79 | .102 | .64 | 2.08* |
| Boston 1/ | 1.15 | 1.20 | .094 | .83 | 2.13* |

* = Significant at the 5-percent level; ** = significant at the 1-percent level.
1/ Lagged 1 week.

States, and Mexico. Total shipments, including imports from Mexico for the winters of 1966-68, ranged from 676 carlots for the week ending January 27, 1968, to 1,439 carlots for the week ending March 18, 1967 (app. table 7). Shipments for Florida included both vine-ripes and mature-greens. For the period studied, weekly carlot tomato shipments averaged 1,028 carlots, of which 522 came from Florida and 499 from Mexico.

Ideally, price and quantity data would have been available to estimate the price of tomatoes of good quality and condition. While price data were available (app. table 2), data on the quantity shipped did not distinguish between grade and size of produce. The quantity of tomatoes of good quality and condition was considered a portion of total tomato shipments.

In estimating the price of tomatoes in southern Florida, temperature and rainfall variables were introduced to act as proxies for changes in the distribution of tomatoes classified as poor, fair, fair to good, and good quality and condition. Changes in quality proportions, while not necessarily influencing shipments, would affect Market News prices quoted for produce of good quality and condition. If weather conditions result in a high proportion of poor quality tomatoes and/or small size tomatoes, the price of large and extra-large tomatoes of good quality and condition would be expected to be higher than for a comparable period when the crop was nearly all of good quality and condition.

Both high and low temperatures have an impact on the quality of tomatoes available. High temperatures may cause tomatoes to ripen and mature rapidly, resulting in soft fruit that cannot be transported to distant markets without considerable spoilage. But since the possibility of frost damage is of greater concern in southern Florida, low temperature variables were introduced in that region to allow for quality changes. The low weekly average temperatures for Pompano Beach the previous week (t-1) were used to represent the Palm Beach-Broward County production area.

Rainfall is also an important determinant of the quality of tomatoes in Florida. Wet weather during the planting season lowers quality and increases disease problems, while dry weather reduces tomato size. Consequently, the amount of rainfall at Pompano Beach, Fla., the previous October was also used as a variable.

To allow for a buildup of supplies in marketing channels, an additional variable was introduced--the ratio of average Florida shipments over the previous 2 weeks to the current week's shipments. Winter tomato production is similar to lettuce in that the perishable nature of tomatoes prevents a smooth flow of produce to market. 14/ Large tomato growers coordinate their planting operations to provide an even flow to market; that is, they attempt to plant about the same acreage of tomatoes each day during the planting season. However, external conditions--rain and cold weather during the growing season or unusually good weather--often result in the speeding up or slowing down of plant growth.

As mentioned previously, tomatoes are a highly perishable commodity that must be marketed as they reach maturity. In periods of surplus, heavy shipments

14/ A similar variable was statistically significant in predicting prices of California-Arizona winter lettuce. (See footnote 11.)

move sluggishly through the marketing system because consuming-center markets are well supplied with produce. Therefore, there is a lag effect on prices due to an inventory or accumulation of produce in marketing channels during periods of surplus; the opposite effect results during periods of light supplies. Some of the relatively high prices received in the winters of 1966-68 came after a week or two of light shipments. Similarly, low prices were observed after periods of heavy shipments.

The relationship between weekly f.o.b. prices of southern Florida large and extra-large tomatoes and the quantity of tomatoes available was estimated for the three winter seasons of 1966-68. The resulting multiple regression equation was:

$$Y_{TFj} = 15.62 - \underset{(0.0014)}{0.0094^{**}} X_{TFj} - \underset{(0.0007)}{0.0012^{a/}} X_{TMj} - \underset{(0.0167)}{0.0446^{*}} T_{j-1} - \underset{(0.0096)}{0.0191^{a/}} R_j$$

$$- \underset{(0.6488)}{2.9957^{**}} P_j \qquad R^2 = 0.73$$

where

$Y_{TFj}$ = the f.o.b. price of southern Florida large and extra-large vine-ripe tomatoes in 20-pound cartons, week j;

$X_{TFj}$ = total carlots of tomatoes shipped from Florida in week j;

$X_{TMj}$ = total carlots of tomatoes shipped from Mexico, week j;

$T_{j-1}$ = previous week's average low temperature at Pompano Beach, Fla.;

$R_j$ = total previous October rainfall at Pompano Beach, Fla., = 34.40 inches in 1965 for winter of 1966; 12.72 inches in 1966 for winter of 1967; and 13.77 inches in 1967 for winter of 1968;

$P_j$ = ratio of average shipments from Florida the previous 2 weeks to the current week's shipments; and

j = weeks 1-39 with 1-13 = winter 1966, 14-26 = winter 1967, and 27-39 = winter 1968.

Standard errors are shown in parentheses. One asterisk represents statistical significance at the 5-percent level; two asterisks, significance at the 1-percent level; a/ significance at the 10-percent level.

Results of the regression equation indicate that Florida shipments, Mexican shipments, temperature, rainfall, and inventory effects all exerted significant influences on the southern Florida f.o.b. shipping-point price of large and extra-large tomatoes. The estimated relationship implies that a 100-carlot increase in weekly southern Florida shipments would be expected to decrease shipping-point price 94 cents; a 100-carlot increase in weekly Mexican shipments

would be expected to decrease the southern Florida price 12 cents. 15/ The equation explained 73 percent of the variation in the weekly average southern Florida shipping-point price of large and extra-large tomatoes.

The equation also indicated that the price of tomatoes of good quality and condition was related to the previous week's average low temperature. Data were not available to indicate the direct causal relationship between temperature and quality or size. However, low temperatures tend to delay growth and problems of alternaria rot greatly increase below 50°. The temperature variable used was significant, indicating that the price of tomatoes in 20-pound cartons, large and extra-large size, in southern Florida declines 4.5 cents for a 1-degree rise in the weekly average low temperature at Pompano Beach. The average weekly low temperature for the period studied was 59 degrees.

The rainfall variable as a price shifter for each winter season was significant at the 10-percent level. Results indicate that an additional inch of rainfall in Pompano Beach the previous fall lowers the southern Florida price of large and extra-large size tomatoes 1.9 cents. To the extent rainfall lowers the quality of tomatoes and increases disease problems, extra rainfall would have a positive rather than a negative influence on price. However, lack of rainfall results in a higher proportion of small size fruit and an increase in prices of large and extra-large tomatoes. The net effect is a negative relationship between southern Florida prices of large and extra-large tomatoes and the amount of rainfall the previous October.

A buildup of supplies in the marketing system decreases the shipping-point price. The estimated effect of an increase of 0.1 in the inventory ratio was to decrease the current week's price 30 cents. Conversely, if average shipments were relatively light during the previous 2 weeks, the current week's predicted price would increase. For example, if it was assumed that the current week's Florida shipments, $X_{TFj}$, were 520 carlots; Mexican shipments, $X_{TMj}$, were 500 carlots; $T_{j-1}$ was 60 degrees; $R_j$ was 12 inches; and $P_j$ was 1.0, the predicted southern Florida price of large and extra-large tomatoes, $Y_{TFj}$, for a particular week would be $4.22. 16/

It was concluded that shortrun variations in shipping-point prices of southern Florida tomatoes, large and extra-large sizes, were related to the quantity of produce available from Florida and Mexico as expected in a competitive market. Climatic variables and an inventory variable improved price estimates since total shipment data did not take into account differences in the distribution of quality and size of tomatoes or in the supply of tomatoes in marketing channels.

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15/ The predicted price for large and extra-large vine-ripes from southern Florida was $4.11, using mean values for the independent variables in the regression equation. The corresponding direct price flexibility was -1.19 and the cross price flexibility with Mexican shipments was -0.15, indicating a substitution effect.

16/ $Y_{TFj} = 15.62 - 0.0094(520) - 0.0012(500) - 0.0446(60) - 0.0191(12) - 2.996(1.0) = \$4.22$.

Results of estimating the relationship between weekly Nogales, Ariz., shipping-point prices of Mexican 6 x 6's and the quantity of tomatoes available were less satisfactory than with Florida tomatoes in terms of explaining variations in price. The multiple regression equation was:

$$Y_{TMj} = 1.79 - \underset{(0.0008)}{0.0017^{*}} X_{TMj} + \underset{(0.0281)}{0.0495}^{a/} T_{Cj-2} - \underset{(0.4342)}{0.7729}^{a/} P_j - \underset{(0.25)}{1.55^{**}} D_{66} - \underset{(0.26)}{1.79^{**}} D_{67} \qquad R^2 = 0.68$$

where

$Y_{TMj}$ = the Nogales, Ariz., f.o.b. price of Mexican 6 x 6 tomatoes in 3-layer lugs, week j;

$X_{TMj}$ = total carlots of tomatoes shipped from Mexico, week j;

$T_{Cj-2}$ = average high temperature, Culiacan, Mexico, 2 weeks previous;

$P_j$ = ratio of average shipments from Florida the previous 2 weeks to the current week's Florida shipments;

$D_{66}$ = dummy or indicator variable for 1966 winter season = 1.0 for 1966 and 0 for 1967 and 1968;

$D_{67}$ = indicator variable for 1967 winter season = 1.0 for 1967 and 0 for 1966 and 1968; and

j = weeks 1-39 with 1-13 = winter 1966, 14-26 = winter 1967, and 27-39 = winter 1968.

Standard errors are shown in parentheses.

The results of the regression equation indicate that Mexican shipments, temperature, Florida inventory effects, and shift variables for the 1966 and 1967 winter seasons all exerted significant influences on the Nogales, Ariz., price of Mexican 6 x 6's. The coefficient 0.0017 associated with Mexican shipments, $X_{TMj}$, was lower than expected. This may be accounted for in part by the significance of the seasonal variables for the winter of 1966 and 1967, $D_{66}$ and $D_{67}$. Weekly Mexican shipments of tomatoes averaged 514 carlots in 1966, 590 carlots in 1967, and 461 carlots in 1968. This is consistent with lower prices for Mexican tomatoes in 1966 and 1967, relative to 1968, as indicated by the coefficients associated with $D_{66}$ and $D_{67}$.

A variable not appearing in the equation is Florida shipments. This variable was not significant in preliminary equations and results were omitted in the report. The quantity of Florida shipments, however, does influence Mexican

prices through the significance of $P_j$, the Florida inventory variable. 17/ If Florida shipments the previous 2 weeks were high relative to the current week's Florida shipments, the net effect would be to depress the price of Mexican tomatoes; a low inventory ratio would have the opposite result.

High temperatures 2 weeks previously in the Culiacan area were associated with higher prices. As noted earlier, high temperatures cause tomatoes to ripen and mature rapidly, resulting in soft fruit that cannot be transported to distant markets without considerable spoilage.

It was concluded that variations in Nogales, Ariz., shipping-point prices were related to the quantity of tomatoes available. This was expected in a competitive market, although results were not as clear cut as with Florida tomatoes.

Over the three winter seasons of 1966-68, the marketing system for fresh winter vine-ripe tomatoes performed reasonably well in transmitting price changes from the shipping point to the wholesale terminal market level. During the same period, shipping-point prices in both southern Florida and Nogales, Ariz., responded to shortrun changes in the quantity of tomatoes available, as expected. The longrun level of shipping-point tomato prices is, of course, determined by growers' planting decisions at the start of each growing season.

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17/ Twenty-three percent of the variation in the price of Mexican 5 x 6's at Nogales could be explained by an equation using data on Mexican and Florida shipments alone. Results were:

$$Y_{TMj\ (5x6)} = 5.78 - \underset{(.00087)}{.00260^{**}}\ X_{TMj} - \underset{(.00112)}{.00199}\ X_{TFj} \qquad R^2 = 0.23$$

where $Y_{TMj\ (5\ x\ 6)}$ is the Nogales, Ariz., f.o.b. price of Mexican 5 x 6's in 2-layer flats, week j; and $X_{TMj}$ and $X_{TFj}$ are Mexican and Florida shipments as previously defined. The coefficient associated with $X_{TFj}$ was significant at the 10-percent level.

Appendix table 1.--Tomato unloads in 41 cities and reported shipments, by State or country of origin, January, February, March 1966-70

| Item | 1966 | 1967 | 1968 | 1969 | 1970 | Total, 1966-70 | |
|---|---|---|---|---|---|---|---|
| | Carlots | Carlots | Carlots | Carlots | Carlots | Carlots | Percent |
| Unloads: | | | | | | | |
| Mexico | 3,263 | 3,337 | 3,339 | 4,105 | 5,462 | 19,506 | 50.57 |
| Florida | 4,193 | 4,558 | 3,853 | 3,390 | 2,236 | 18,230 | 47.27 |
| California | 85 | 120 | 149 | 103 | 141 | 598 | 1.55 |
| Other States | 48 | 55 | 45 | 34 | 34 | 216 | .56 |
| Other imports | 2 | 7 | 1 | 5 | 3 | 18 | .05 |
| Total | 7,591 | 8,077 | 7,387 | 7,637 | 7,876 | 38,568 | 100.00 |
| Shipments: | | | | | | | |
| Mexico | 4,999 | 5,300 | 5,194 | 6,541 | 8,469 | 30,503 | 50.57 |
| Florida | 6,709 | 7,500 | 6,032 | 5,618 | 3,329 | 29,188 | 48.39 |
| California | 110 | 106 | 117 | 68 | 87 | 488 | .81 |
| Other States | 4 | --- | --- | 6 | 0 | 10 | .01 |
| Other imports | 3 | 18 | 15 | 37 | 60 | 133 | .22 |
| Total | 11,825 | 12,924 | 11,358 | 12,270 | 11,945 | 60,322 | 100.00 |

Source: Consumer and Marketing Service, U.S. Department of Agriculture.

Appendix table 2.--Weekly average f.o.b. tomato prices, Nogales, Ariz., southern Florida, and Dade County, Fla., January, February, March 1966-68

| Year and week ending-- | Vine-ripe | | | | | Mature-green |
|---|---|---|---|---|---|---|
| | Nogales, Ariz. | | | Southern Florida | | Dade County, Fla. |
| | 2-layer flat | 3-layer lug | | 20-pound carton | | 40-pound carton |
| | 5 x 6 | 6 x 6 | 6 x 7 | Large and extra-large | Medium-large | 6 x 6 and larger |
| | Dollars | | | | | |
| 1966: | | | | | | |
| Jan. 7 | 3.07 | 3.92 | 3.20 | 3.50 | 2.50 | 4.33 |
| 14 | 3.28 | 3.90 | 3.43 | 3.46 | 2.58 | 4.75 |
| 21 | 3.08 | 3.73 | 3.52 | 3.75 | 2.92 | 4.50 |
| 28 | 3.28 | 4.00 | 3.60 | 4.00 | 3.00 | 4.50 |
| Feb. 4 | 4.55 | 5.47 | 4.92 | 4.54 | 3.67 | 5.50 |
| 11 | 2.97 | 4.07 | 3.60 | 3.67 | 2.92 | 5.91 |
| 18 | 2.38 | 3.30 | 2.90 | 2.17 | 1.63 | 4.62 |
| 25 | 1.96 | 2.68 | 2.50 | 1.92 | 1.46 | 3.25 |
| Mar. 4 | 2.22 | 2.60 | 2.41 | 2.79 | 2.08 | 4.50 |
| 11 | 2.83 | 3.30 | 3.18 | 3.25 | 2.71 | 4.67 |
| 18 | 2.78 | 3.70 | 3.58 | 3.67 | 2.67 | 6.00 |
| 25 | 2.82 | 4.09 | 4.09 | 4.25 | 3.13 | 7.25 |
| Apr. 1 | 2.87 | 3.96 | 3.92 | 5.00 | 4.17 | 7.50 |
| Average, winter 1966 | 2.93 | 3.75 | 3.45 | 3.54 | 2.73 | 5.18 |
| 1967: | | | | | | |
| Jan. 6 | 3.71 | 4.25 | 3.63 | 4.00 | 2.75 | 4.58 |
| 13 | 4.00 | 4.56 | 4.12 | 3.21 | 2.13 | 3.58 |
| 20 | 2.45 | 3.38 | 3.08 | 2.58 | 2.00 | 3.50 |
| 27 | 2.33 | 2.78 | 2.73 | 2.67 | 1.88 | 3.50 |
| Feb. 3 | 2.48 | 2.95 | 2.67 | 3.33 | 2.33 | 4.33 |
| 10 | 3.80 | 4.35 | 3.80 | 4.08 | 3.08 | 6.08 |
| 17 | 3.47 | 4.20 | 3.73 | 3.08 | 2.08 | 5.92 |
| 24 | 2.31 | 2.94 | 2.68 | 2.83 | 1.88 | 4.00 |

Continued--

Appendix table 2.--Weekly average f.o.b. tomato prices, Nogales, Ariz., southern Florida, and Dade County, Fla., January, February, March 1966-68--Continued

| Year and week ending-- | Vine-ripe | | | | | Mature-green |
|---|---|---|---|---|---|---|
| | Nogales, Ariz. | | | Southern Florida | | Dade County, Fla. |
| | 2-layer flat | 3-layer lug | | 20-pound carton | | 40-pound carton |
| | 5 x 6 | 6 x 6 | 6 x 7 | Large and extra-large | Medium-large | 6 x 6 and larger |
| | Dollars | | | | | |
| Mar. 3 | 3.67 | 4.45 | 4.02 | 4.00 | 3.00 | 6.42 |
| 10 | 3.33 | 4.42 | 4.02 | 3.83 | 2.83 | 6.50 |
| 17 | 3.00 | 3.50 | 3.03 | 3.00 | 2.00 | 5.92 |
| 24 | 2.83 | 3.20 | 2.75 | 3.00 | 2.00 | 4.50 |
| 31 | 3.47 | 3.94 | 3.44 | 4.00 | 3.00 | 5.50 |
| Average, winter 1967 | 3.14 | 3.76 | 3.36 | 3.35 | 2.38 | 4.95 |
| 1968: | | | | | | |
| Jan. 5 | 5.16 | 6.19 | 5.19 | 5.00 | 3.75 | 8.33 |
| 12 | 4.85 | 6.20 | 5.10 | 4.67 | 3.67 | 8.00 |
| 19 | 3.38 | 4.37 | 3.96 | 4.17 | 3.17 | 7.67 |
| 26 | 4.69 | 5.56 | 4.91 | 4.83 | 3.83 | 7.38 |
| Feb. 2 | 4.44 | 5.50 | 4.62 | 5.33 | 4.33 | 9.00 |
| 9 | 3.95 | 4.80 | 4.10 | 4.25 | 3.42 | 8.50 |
| 16 | 4.40 | 5.35 | 4.35 | 5.92 | 4.92 | 9.00 |
| 23 | 4.28 | 5.31 | 4.38 | 5.75 | 4.75 | 9.00 |
| Mar. 1 | 4.08 | 5.45 | 4.94 | 6.00 | 5.00 | 9.00 |
| 8 | 3.55 | 4.80 | 4.43 | 5.25 | 4.25 | 8.33 |
| 15 | 3.65 | 4.67 | 4.28 | 4.50 | 3.50 | 7.00 |
| 22 | 4.23 | 5.80 | 5.20 | 4.92 | 3.92 | 8.00 |
| 29 | 4.78 | 6.19 | 5.62 | 5.33 | 4.33 | 8.50 |
| Average, winter 1968 | 4.26 | 5.40 | 4.70 | 5.07 | 4.06 | 8.29 |
| Average, winters 1966-68 | 3.45 | 4.30 | 3.84 | 3.99 | 3.06 | 6.07 |

Sources: Consumer and Marketing Service, U.S. Department of Agriculture; Florida Department of Agriculture.

Appendix table 3.--Unloads in selected cities of tomatoes originating in Mexico, Florida, and all origins, January, February, March 1966-70

| City | Florida | | | | Mexico | | | | Total, all origins 1/ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rail | Piggy-back | Truck | Total | Rail | Piggy-back | Truck | Total | Rail | Piggy-back | Truck | Total |
| | Carlots | | | | | | | | | | | |
| Seattle | 87 | --- | 35 | 122 | 44 | --- | 487 | 531 | 131 | --- | 523 | 654 |
| San Francisco | 1 | --- | 57 | 58 | 11 | 27 | 1,858 | 1,896 | 12 | 27 | 1,941 | 1,980 |
| Los Angeles | 2 | 2 | 42 | 46 | 24 | 522 | 4,453 | 4,999 | 26 | 524 | 4,823 | 5,373 |
| Detroit | 50 | 341 | 870 | 1,261 | 135 | 114 | 437 | 686 | 185 | 455 | 1,318 | 1,958 |
| Dallas | 1 | --- | 144 | 145 | 4 | 5 | 850 | 859 | 5 | 5 | 996 | 1,006 |
| St. Louis | 2 | 16 | 134 | 152 | 23 | 10 | 407 | 440 | 25 | 26 | 543 | 594 |
| Chicago | 53 | 230 | 680 | 963 | 130 | 926 | 399 | 1,455 | 190 | 1,156 | 1,106 | 2,452 |
| Pittsburgh | 1 | 5 | 793 | 799 | 13 | 13 | 170 | 196 | 14 | 18 | 997 | 1,029 |
| Atlanta | 31 | 10 | 923 | 964 | 3 | 4 | 257 | 264 | 34 | 14 | 1,181 | 1,229 |
| Washington, D.C. | 25 | 96 | 582 | 703 | 36 | --- | 170 | 206 | 61 | 96 | 763 | 920 |
| New York | 57 | 1,498 | 2,311 | 3,866 | 91 | 321 | 798 | 1,210 | 168 | 1,824 | 3,147 | 5,139 |
| Boston | 127 | 397 | 704 | 1,228 | 61 | 8 | 281 | 350 | 200 | 405 | 995 | 1,600 |
| Total, 41 cities | 4,142 | n.a. | 14,088 | 18,230 | 3,465 | n.a. | 16,041 | 19,506 | 7,656 | n.a. | 31,147 | 38,803 |

n.a. = Not available.

1/ Includes imports.

Source: Consumer and Marketing Service, U.S. Department of Agriculture.

Appendix table 4.--Breakdown of average weekly gross margin between Mexican vine-ripe tomato prices in Nogales, Ariz., and selected cities, January, February, March 1966 and 1967

| City | Size | Trucking costs | Winter 1966 | | | | Winter 1967 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean price | | Gross margin | Residual margin | Mean price | | Gross margin | Residual margin |
| | | | Shipping point | Consuming-center market | | | Shipping point | Consuming-center market | | |
| | | Dollars | | | | | | | | |
| Los Angeles | 5 x 6 1/ | 0.25 | 2.93 | 3.29 | 0.36 | 0.11 | 3.14 | 3.55 | 0.41 | 0.16 |
| San Francisco | do. | .38 | 2.93 | 3.73 | .80 | .42 | 3.14 | 3.90 | .76 | .38 |
| Seattle | do. | .55 | 2.93 | 4.69 | 1.76 | 1.21 | 3.14 | 4.97 | 1.83 | 1.28 |
| Dallas | do. | .38 | 2.93 | 3.56 | .63 | .25 | 3.14 | 3.76 | .62 | .24 |
| St. Louis | do. | .47 | 2.93 | 3.74 | .81 | .34 | 3.14 | 4.01 | .87 | .40 |
| Simple average | do. | -- | -- | -- | -- | .47 | -- | -- | -- | .49 |
| Weighted average 2/ | do. | -- | -- | -- | -- | .26 | -- | -- | -- | .30 |
| Los Angeles | 6 x 6 3/ | .33 | 3.75 | 4.07 | .32 | .01 | 3.76 | 4.15 | .39 | .06 |
| San Francisco | do. | .51 | 3.75 | 4.49 | .74 | .23 | 3.76 | 4.66 | .90 | .39 |
| Seattle | do. | .73 | 3.75 | 5.60 | 1.85 | 1.12 | 3.76 | 6.02 | 2.26 | 1.53 |
| St. Louis | do. | .62 | 3.75 | 4.70 | .95 | .33 | 3.76 | 4.97 | 1.21 | .59 |
| Chicago | do. | .80 | 3.75 | 4.63 | .88 | .08 | 3.76 | 4.57 | .81 | .01 |
| Simple average | do. | -- | -- | -- | -- | .35 | -- | -- | -- | .52 |
| Weighted average 2/ | do. | -- | -- | -- | -- | .13 | -- | -- | -- | .24 |
| Los Angeles | 6 x 7 3/ | .33 | 3.45 | 3.70 | .25 | -.08 | 3.36 | 3.59 | .23 | -.10 |
| San Francisco | do. | .51 | 3.45 | 4.05 | .60 | .09 | 3.36 | 4.06 | .70 | .19 |
| Seattle | do. | .73 | 3.45 | 5.26 | 1.81 | 1.08 | 3.36 | 5.40 | 2.04 | 1.31 |
| Dallas | do. | .51 | 3.45 | 4.08 | .63 | .12 | 3.36 | 4.01 | .65 | .14 |
| Simple average | do. | -- | -- | -- | -- | .30 | -- | -- | -- | .38 |
| Weighted average 2/ | do. | -- | -- | -- | -- | .04 | -- | -- | -- | .09 |

1/ 2-layer flats.
2/ 3-layer lugs.
3/ Weighted by unloads from Mexico.

Appendix table 5.--Breakdown of average weekly gross margin between Mexican vine-ripe tomato prices in Nogales, Ariz., and selected cities, January, February, March 1968

| City | Size | Trucking costs | Mean price | | Gross margin | Residual margin |
|---|---|---|---|---|---|---|
| | | | Shipping point | Consuming-center market | | |
| | | Dollars | | | | |
| Los Angeles | 5 x 6 1/ | 0.25 | 4.26 | 4.82 | 0.56 | 0.31 |
| San Francisco | do. | .38 | 4.26 | 5.41 | 1.15 | .77 |
| Seattle | do. | .55 | 4.26 | 6.29 | 2.03 | 1.48 |
| Dallas | do. | .38 | 4.26 | 5.09 | .83 | .45 |
| St. Louis | do. | .47 | 4.26 | 4.92 | .66 | .19 |
| Simple average | do. | -- | -- | -- | -- | .64 |
| Weighted average 2/ | do. | -- | -- | -- | -- | .48 |
| Los Angeles | 6 x 6 3/ | .33 | 5.40 | 5.83 | .43 | .10 |
| San Francisco | do. | .51 | 5.40 | 6.36 | .96 | .45 |
| Seattle | do. | .73 | 5.40 | 7.68 | 2.28 | 1.55 |
| St. Louis | do. | .62 | 5.40 | 6.39 | .99 | .37 |
| Chicago | do. | .80 | 5.40 | 6.28 | .88 | .08 |
| Simple average | do. | -- | -- | -- | -- | .51 |
| Weighted average 2/ | do. | -- | -- | -- | -- | .26 |
| Los Angeles | 6 x 7 3/ | .33 | 4.70 | 5.13 | .43 | .10 |
| San Francisco | do. | .51 | 4.70 | 5.73 | 1.03 | .52 |
| Seattle | do. | .73 | 4.70 | 6.98 | 2.28 | 1.55 |
| Dallas | do. | .51 | 4.70 | 5.41 | .71 | .20 |
| Simple average | do. | -- | -- | -- | -- | .59 |
| Weighted average 2/ | do. | -- | -- | -- | -- | .29 |

1/ 2-layer flats.
2/ Weighted by unloads from Mexico.
3/ 3-layer lugs.

Appendix table 6.--Breakdown of average weekly gross margin for prices of Florida vine-ripe tomatoes, 20-pound cartons, large and extra-large size, southern Florida and selected cities, January, February, March 1966-68

| City and season | Trucking costs 1/ | Mean price | | Gross margin | Residual margin |
|---|---|---|---|---|---|
| | | Shipping point | Consuming-center market | | |
| | Dollars | | | | |
| Winter 1966: | | | | | |
| Washington, D.C. | 0.35 | 3.54 | 4.26 | 0.72 | 0.37 |
| Pittsburgh | .45 | 3.54 | 4.05 | .51 | .06 |
| Chicago | .50 | 3.54 | 4.07 | .53 | .03 |
| Detroit | .50 | 3.54 | 4.22 | .68 | .18 |
| New York | .45 | 3.54 | 4.31 | .77 | .22 |
| Simple avg. | -- | -- | -- | -- | .17 |
| Weighted avg. 2/ | -- | -- | -- | -- | .19 |
| Winter 1967: | | | | | |
| Washington, D.C. | .35 | 3.35 | 4.00 | .65 | .30 |
| Pittsburgh | .45 | 3.35 | 3.84 | .49 | .04 |
| Chicago | .50 | 3.35 | 4.23 | .88 | .38 |
| Detroit | .50 | 3.35 | 4.13 | .78 | .28 |
| New York | .45 | 3.35 | 4.21 | .86 | .41 |
| Simple avg. | -- | -- | -- | -- | .28 |
| Weighted avg. 2/ | -- | -- | -- | -- | .34 |
| Winter 1968: | | | | | |
| Washington, D.C. | .35 | 5.07 | 5.75 | .68 | .33 |
| Pittsburgh | .45 | 5.07 | 5.66 | .59 | .14 |
| Chicago | .50 | 5.07 | 5.87 | .80 | .30 |
| Detroit | .50 | 5.07 | 5.94 | .87 | .37 |
| New York | .45 | 5.07 | 5.87 | .80 | .35 |
| Simple avg. | -- | -- | -- | -- | .30 |
| Weighted avg. 2/ | -- | -- | -- | -- | .33 |

1/ 1967/68 rates.
2/ Weighted by unloads from Florida.

Appendix table 7.--Rail, truck, and total shipments of tomatoes from Florida, other States, Mexico, and United States, by weeks, January, February, March 1966-68

| Year and week ending-- | Florida | | | Other States | | | Mexico | | | | | | | United States | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | West | | | East | | | Total | | | |
| | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total | | Rail | Truck | Total |
| | Carlots | | | | | | | | | | | | | | | |
| 1966: | | | | | | | | | | | | | | | | |
| January 8 | 108 | 404 | 512 | - | 7 | 7 | 20 | 267 | 287 | - | - | - | 287 | 128 | 678 | 806 |
| 15 | 135 | 456 | 591 | - | 6 | 6 | 31 | 307 | 338 | - | - | - | 338 | 166 | 769 | 935 |
| 22 | 197 | 477 | 674 | 1 | 4 | 5 | 57 | 386 | 443 | - | - | - | 443 | 255 | 867 | 1,122 |
| 29 | 97 | 315 | 412 | 1 | 5 | 6 | 43 | 308 | 351 | - | - | - | 351 | 141 | 628 | 769 |
| February 5 | 109 | 356 | 465 | 1 | 4 | 5 | 54 | 348 | 402 | - | 2 | 2 | 404 | 164 | 710 | 874 |
| 12 | 186 | 510 | 696 | - | 5 | 5 | 65 | 468 | 533 | - | 2 | 2 | 535 | 251 | 985 | 1,236 |
| 19 | 94 | 571 | 665 | - | 6 | 6 | 68 | 483 | 551 | - | 2 | 2 | 553 | 162 | 1,062 | 1,224 |
| 26 | 28 | 484 | 512 | 2 | 7 | 9 | 43 | 537 | 580 | - | 4 | 4 | 584 | 73 | 1,032 | 1,105 |
| March 5 | 91 | 463 | 554 | - | 6 | 6 | 101 | 447 | 548 | - | 2 | 2 | 550 | 192 | 918 | 1,110 |
| 12 | 33 | 419 | 452 | - | 7 | 7 | 118 | 470 | 588 | - | 1 | 1 | 589 | 151 | 897 | 1,048 |
| 19 | 30 | 383 | 413 | - | 7 | 7 | 134 | 583 | 717 | - | 1 | 1 | 718 | 164 | 974 | 1,138 |
| 26 | 38 | 386 | 424 | - | 8 | 8 | 148 | 657 | 805 | - | 11 | 11 | 816 | 186 | 1,062 | 1,248 |
| April 2 | 53 | 260 | 313 | - | 5 | 5 | 132 | 649 | 781 | - | 17 | 17 | 798 | 185 | 931 | 1,116 |
| Total, winter 1966 | 1,199 | 5,484 | 6,683 | 5 | 77 | 82 | 1,014 | 5,910 | 6,924 | - | 42 | 42 | 6,966 | 2,218 | 11,513 | 13,731 |
| Avg., winter 1966 | 92 | 422 | 514 | - | 6 | 6 | 78 | 455 | 533 | - | 3 | 3 | 536 | 171 | 886 | 1,056 |
| 1967: | | | | | | | | | | | | | | | | |
| January 7 | 160 | 436 | 596 | 1 | 10 | 11 | 24 | 272 | 296 | 4 | 12 | 16 | 312 | 189 | 730 | 919 |
| 14 | 149 | 596 | 745 | - | 8 | 8 | 25 | 280 | 305 | 4 | 8 | 12 | 317 | 178 | 892 | 1,070 |
| 21 | 76 | 442 | 518 | 2 | 7 | 9 | 9 | 409 | 418 | 2 | 1 | 3 | 421 | 89 | 859 | 948 |
| 28 | 101 | 497 | 598 | 5 | 7 | 12 | 13 | 432 | 445 | 3 | 1 | 4 | 449 | 122 | 937 | 1,059 |
| February 4 | 76 | 406 | 482 | 4 | 4 | 8 | 16 | 453 | 469 | - | 1 | 1 | 470 | 96 | 864 | 960 |
| 11 | 61 | 443 | 504 | 1 | 8 | 9 | 28 | 486 | 514 | - | 9 | 9 | 523 | 90 | 946 | 1,036 |
| 18 | 141 | 539 | 680 | 1 | 8 | 9 | 27 | 455 | 482 | - | 14 | 14 | 496 | 169 | 1,016 | 1,185 |
| 25 | 100 | 418 | 518 | 1 | 6 | 7 | 36 | 467 | 503 | - | 6 | 6 | 509 | 137 | 897 | 1,034 |
| March 4 | 116 | 376 | 492 | - | 5 | 5 | 46 | 450 | 496 | 7 | 9 | 16 | 512 | 169 | 840 | 1,009 |
| 11 | 125 | 531 | 656 | - | 8 | 8 | 40 | 692 | 732 | 13 | 13 | 26 | 758 | 178 | 1,244 | 1,422 |
| 18 | 155 | 576 | 731 | - | 5 | 5 | 45 | 635 | 680 | 14 | 9 | 23 | 703 | 214 | 1,225 | 1,439 |
| 25 | 119 | 393 | 512 | - | 9 | 9 | 37 | 436 | 473 | 6 | 6 | 12 | 485 | 162 | 844 | 1,006 |
| April 1 | 186 | 452 | 638 | - | 6 | 6 | 11 | 386 | 397 | 2 | 4 | 6 | 403 | 199 | 848 | 1,047 |
| Total, winter 1967 | 1,565 | 6,105 | 7,670 | 15 | 91 | 106 | 357 | 5,853 | 6,210 | 55 | 93 | 148 | 6,358 | 1,992 | 12,142 | 14,134 |
| Avg., winter 1967 | 120 | 470 | 590 | 1 | 7 | 8 | 27 | 450 | 478 | 4 | 7 | 11 | 489 | 153 | 934 | 1,087 |
| 1968: | | | | | | | | | | | | | | | | |
| January 6 | 90 | 414 | 504 | 1 | 36 | 37 | 4 | 244 | 248 | 4 | 10 | 14 | 262 | 99 | 704 | 803 |
| 13 | 118 | 466 | 584 | - | 17 | 17 | 9 | 318 | 327 | 4 | 12 | 16 | 343 | 131 | 813 | 944 |
| 20 | 74 | 349 | 423 | 1 | 14 | 15 | 6 | 465 | 471 | 3 | 15 | 18 | 489 | 84 | 843 | 927 |
| 27 | 45 | 260 | 305 | 1 | 7 | 8 | 7 | 342 | 349 | - | 14 | 14 | 363 | 53 | 623 | 676 |
| February 3 | 72 | 401 | 473 | - | 10 | 10 | 3 | 504 | 507 | 1 | 12 | 13 | 520 | 76 | 927 | 1,003 |
| 10 | 53 | 380 | 433 | - | 5 | 5 | 7 | 533 | 540 | 4 | 14 | 18 | 558 | 64 | 932 | 996 |
| 17 | 58 | 331 | 389 | - | 5 | 5 | 3 | 477 | 480 | 3 | 9 | 12 | 492 | 64 | 822 | 886 |
| 24 | 78 | 319 | 397 | - | 3 | 3 | 2 | 448 | 450 | 4 | 10 | 14 | 464 | 84 | 780 | 864 |
| March 2 | 108 | 365 | 473 | - | 4 | 4 | 5 | 650 | 655 | 11 | 14 | 25 | 680 | 124 | 1,033 | 1,157 |
| 9 | 79 | 337 | 416 | - | 2 | 2 | 3 | 677 | 680 | 8 | 4 | 12 | 692 | 90 | 1,020 | 1,110 |
| 16 | 145 | 370 | 515 | - | 2 | 2 | 5 | 443 | 448 | 7 | 6 | 13 | 461 | 157 | 821 | 978 |
| 23 | 149 | 459 | 608 | - | 4 | 4 | 3 | 422 | 425 | 13 | 2 | 15 | 440 | 165 | 887 | 1,052 |
| 30 | 105 | 365 | 470 | - | 4 | 4 | 2 | 351 | 353 | 3 | 4 | 7 | 360 | 110 | 724 | 834 |
| Total, winter 1968 | 1,174 | 4,816 | 5,990 | 3 | 113 | 116 | 59 | 5,874 | 5,933 | 65 | 126 | 191 | 6,124 | 1,301 | 10,929 | 12,230 |
| Avg., winter 1968 | 90 | 370 | 461 | - | 9 | 9 | 5 | 452 | 456 | 5 | 10 | 15 | 471 | 100 | 841 | 941 |
| Avg., winters 1966-68 | 101 | 421 | 522 | 1 | 7 | 8 | 37 | 452 | 489 | 3 | 7 | 10 | 499 | 141 | 887 | 1,028 |

Source: Consumer and Marketing Service, U.S. Department of Agriculture.